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EDITED IN ENGLISH AND GERMAN

BY

DR. H. KNAPP
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AND

DR. C. SCHWEIGER
OF BERLIN

DR. W. A. HOLDEN
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ARCHIVES OF OPHTHALMOLOGY.

DOUBLE NASAL HEMIANOPSIA FOLLOWING A FALL ON THE HEAD.

By SWAN M. BURNETT, M.D., Ph.D., WASHINGTON, D. C.

(With four text illustrations.)

IF we are to judge from our text-books and periodicals, nasal hemianopsia is a rare phenomenon.¹ Most of the treatises pass it over with a short paragraph; some of them do not mention it at all. Swanzy naïvely remarks: "... it is doubtful whether nasal hemianopsia has been really observed, although it has been described" (*Diseases of the Eye*, 1897). Panas, in his treatise published in 1894, says "up to this time not more than a dozen cases have been reported," and from the context we judge he questions the validity of some of these. Up to the present time, the most thorough study of the whole subject is to be found in Mauthner's classical treatise *Gehirn und Auge*, published in 1881. To this we shall have to refer later.

Most of the few cases that have been reported have been scanty in their history and observed generally for only a short length of time. The autopsies have been very limited in number, and in none has the connection between the phenomenon and the supposed cause been demonstrated to universal satisfaction. In the hope that a little light may be thrown upon an acknowledged obscure condition, there seems then hardly an excuse needed for reporting with considerable detail another case which has been under observation for three years.

¹ In the *Ophthalmic Review* for February, 1897, Dr. C. A. Veasy gives a bibliography of twenty cases in all, reported up to that date, in addition to his own.

Dr. G. W. C., a healthy-looking man, weighing one hundred and eighty pounds, aged forty, was first seen by me on the 12th of Feb., 1896. He related that nine days before, while returning from a visit to a patient at one o'clock in the morning, in alighting from a street car in motion he fell face foremost, striking his forehead against the ground. There was no unconsciousness at the time and, on recovering himself, he went at once to his house, a few blocks away, and applied hot fomentations to his forehead. On reaching his home, he noticed that vision in the right eye was obscured. There was also an ecchymosis of the conjunctiva which had disappeared when I saw him. His vision had never been

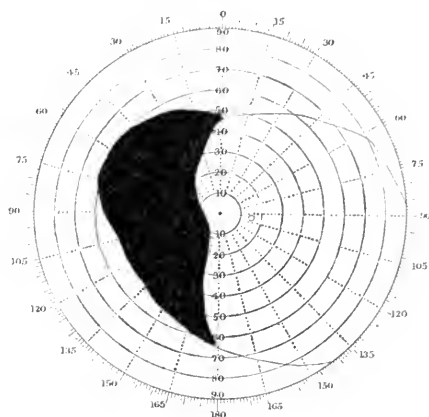


FIG. 1.

V. F. R. E., Feb. 15, 1896.

good and he has, since early manhood, worn on each eye strong convex glasses varying from $+6.5$ to $+8$. At this first examination the vision in the *right* eye was much reduced and the nasal half of the field was entirely lacking. The fundus of the left, uninjured, eye was not different from what might be a normal condition; its vision was, with the glasses he had been wearing, $\frac{5}{60}$, and was about the same as it had always been. The central vision in the right eye, with correction of ametropia, was not better than $\frac{5}{60}$, and there was a blur over all objects. An ophthalmoscopic examination showed the retinal veins tortuous and embedded in a swollen retina for some distance from the disk. The outline of the disk was indistinct. There were no hemorrhages and the m. l. was not noticeably changed. The visual field was not taken by the perimeter on this day, but was carefully mapped

out on the 15th and was as shown in the diagram (Fig. 1). On this date the central vision was clearer.

The condition as regards the swelling of the retina and the tortuosity of the veins gradually improved, but the disk began to assume a whiter hue, as compared with its fellow. The vision also gradually improved so that on the 22d of April it was $\frac{5}{34}$ with + 8. The hemianopsia, however, remained essentially the same. The field of vision was examined frequently, and while there were slight variations from time to time, they could very properly be referred to errors of observation. The line of demarcation was always practically vertical, passing near the point of fixation, to the outer side for about 5° or 10° , as is the case in typical hemianopsia. From this it has not deviated to this time.

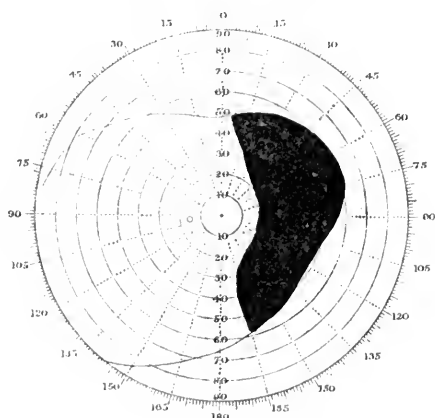


FIG. 2.
V. F. L. E., June 24, 1896.

Early in May, that is, about three months after the injury, he noticed that the *left* eye was failing and that with it objects had a yellow tinge. An examination made on the 11th of the month revealed a blurring of the edge of the disk, and an enlargement and tortuosity of the veins, just such as had been observed in the eye first affected. There were no hemorrhages in the retina. A nasal hemianopsia was found in this eye also, with its line of demarcation vertical, but less sharply marked, there being a narrow zone to the nasal side, in which there was still perception of light: The o. d. of the right, first affected, eye was much whiter. Condition otherwise unchanged. On the 14th, some small hemorrhages were seen near the disk in the left, down and in, the

direction in which the veins were most tortuous. On the 18th, the œdema of the retina had apparently increased, but the hemorrhages had disappeared. On the 30th, there was some perception of light in this eye for a few degrees toward the defective side of the visual field. June 13th: He has been suffering from intense headaches, mostly at the occiput, almost constantly for several weeks. The optic disk of the left, last affected, eye is getting whiter, and the vessels, particularly the veins, are diminishing in calibre. There are periods in which his vision generally seems to be worse. June 24th: Disk whiter and arteries so small that they can hardly be distinguished. The area of light perception had increased and the field at that time is shown in Fig. 2.

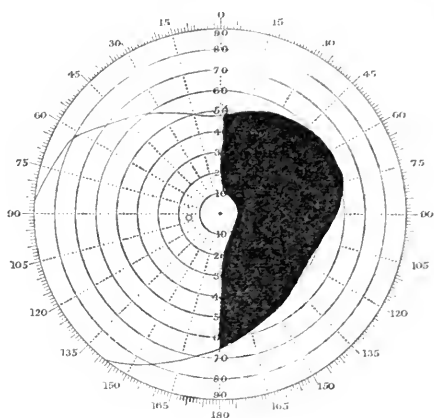


FIG. 3.

V. F. L. E., Sept. 1, 1897.

Up to July 24th there was little change in the condition of either eye. Both nerve heads are now perfectly white.

On the 21st of September he again presented himself with a complaint of headache which had been persistent for about thirty days. It was occipital as before. He always waked with it in the morning. His mental faculties are good. He sneezes a good deal, and there is a feeling of fulness in the soft palate and a watery discharge from the nose, especially the right nostril. The hemianopsic condition remains essentially the same. His vision is better in intense light. About this time he began to experience chromatopsic illusions. He would see banks of the most vividly colored flowers, whose hues were richer than anything he had ever seen before. These were most commonly seen on first

waking in the morning. These lasted several weeks and gradually wore away. The lacking portion of the field in the left eye is not uniformly dark, but there are islets in which some luminosity is apparent. The visual power in the clear portion is, however, still very low.

No change of importance was noted till Sept. 1, 1897, when he had an attack of rheumatism in the right foot, lasting for three weeks. The condition of the fields was about as at last report, the left free field being larger than the right, but the vision was still not above counting fingers at 2 metres. V. in the right $\frac{5}{20}$ with +6.5. Disks both white. On May 1, 1899, the date of the last examination, the left field had contracted to the limit shown in Fig. 3 and the defective portion was all dark. The field in the right eye was unchanged from that shown in Fig. 1. R. V. = $\frac{5}{20}$ with +6.5. L. fingers at 3 metres. Condition of fundus same as at last report. At no time has his urine, which was frequently examined, shown any material departure from the normal. No evidence of syphilis.

The exact etiology and precise location of the lesion of double nasal hemianopsia is still unsettled. There being a defect corresponding to the temporal halves of the two retinæ, if the cause is extra-ocular, there must be, in some way, an inhibitory influence on the nerve fibres connecting these lateral halves with the brain. The difficulty is in locating the seat of the lesion at some definite spot along the course of the fibres from the optic-nerve entrance to the ending of the tracts in the brain.

It is possible, among other conditions, to suppose that the pressure is exerted at the lamina cribrosa, or scleral ring, as in inflammations of the nerve head due to nephritis, brain tumor, or other cause. Mauthner is much inclined to this view, as the most nearly satisfactory explanation in the majority of cases reported up to the time of publication of his treatise in 1881. Even those cases of nasal hemianopsia associated with brain disease, he is disposed to regard as depending on the papillitis rather than on the cerebral lesion. Considering, however, the comparative frequency of papillitis, and the extreme rarity of the phenomenon of nasal hemianopsia, such a connection must be considered very improbable, especially in the absence of a demonstration

of such symmetrical localized pressure at the lamina cribrosa in any reported case.

A cerebral lesion is possible, and in a case reported by Daac (1870) a probable disturbance at the cerebral centres was the only assignable cause. The direct connection, however, was not revealed at the autopsy.

The only remaining likely determining agent is pressure either on the nerve trunks or the tracts. Knapp (1873) reported a case of double nasal hemianopsia in which there was found, on autopsy, an atheromatous degeneration of the circle of Willis, and a reduction of the art. communicans post. to hard cords which pressed upon both sides of the chiasma. Mauthner does not regard this explanation as convincing, because atheromatous conditions of that kind are not rare, while nasal hemianopsia is very uncommon. Plenck made perimetric examinations of a number of individuals from seventy to eighty-three years of age, in the greater number of whom the atheromatous condition of the vessels was very pronounced, and in no instance was any notable restriction of the visual field found. Our difficulties are much increased, in such cases as that now reported, by the

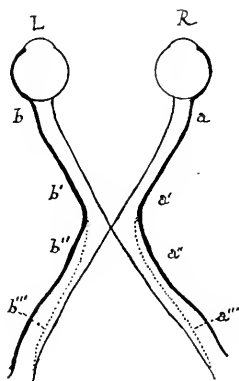


FIG. 4.

a a' a'' a''', *b b' b'' b'''* represent the presumed course of the uncrossed fibres.

necessity of having a doubly operating cause symmetrically placed so as to affect the temporal fibres only, leaving the others more or less intact. This is assuming, of course, that we accept the semi-dicussion theory, and that in the nerve

trunks at least, it is the lateral bundles that supply the temporal halves of the retinae. In the scheme which has been commonly accepted, and which is found in all text-books (Fig. 4), pressure made simultaneously at the points *a b, a' b', a'' b''*, would intercept impressions made on the temporal halves of the two retinae on their way to the brain and thus give rise to the phenomena under consideration.

Such a peculiar concatenation of circumstances must be exceedingly rare as would lead to a single pathological lesion producing this effect. Writing in 1872, Mauthner announced that when a case of true nasal hemianopsia occurred, for so extraordinary a condition there must be an extraordinarily uncommon cause. Professor Schott reported in Knapp's ARCHIVES, 1877, a case which almost, but not exactly, fulfilled these requirements. An endothelioma was found pressing upon the right nerve on the inner side, reaching from near the optic-nerve entrance to the chiasma, while, on the other side, another tumor encroached on the left nerve to about the same extent, but obliquely, a part being on the outer side and a part on the upper surface. This, while indeed producing a nasal hemianopsia on the right side, would cause a temporal hemianopsia on the left side; in other words, a left-sided hemianopsia, but without sharply defined or typical limits. This case only shows that it is possible for two tumors to be pressing upon the two nerves simultaneously, and entirely independent of each other,—and there is, of course, always the possibility that sometimes it may happen that one of two tumors may affect the outer side of the right nerve, *a*, and another the outer side, *b* (Fig. 4), of the left nerve. Mauthner also suggests the possibility of a single tumor spanning the chiasma above or below, making pressure on both sides, at *a* and *b*, but leaving the surface between intact. It is of interest to note, however, in this connection, that so eminent an authority as Gowers should say: "I think that nasal hemianopsia has never been due to disease behind the chiasma, and I cannot conceive that it could be so produced." It will be thus seen how little of fact and how much of speculation has entered into the locating of the lesion in nasal hemianopsia.

Wilbrand, in summing up his brief consideration of nasal hemianopsia in the Norris and Oliver *System*, vol. ii., p. 272, says: "The cases of nasal hemianopsia described by other authors [aside from those published by Uhthoff in 1887, Knapp, 1873, and Henschen, 1890] seem to belong to symmetrical diseases of both optic nerves, because in none were found distinct lines of separation of the two halves of the fields."



Studying our own case then in the light of preceding cases and these varying opinions, where is the most likely seat of the lesion, or lesions?

Summarizing briefly the facts in the case we have: a fall on the forehead in a man over forty, with rupture of a conjunctival vessel of the right eye, and immediately a dimness of vision in the same eye. Nine days afterward there was found a clearly defined nasal hemianopsia, which has remained practically unchanged from that time till now, more than three years afterward. At the same time there was a marked, but not a profound, papillitis, which gradually went over into a distinct atrophy of the nerve head. Two months after the accident, and after the atrophy of the right nerve had set in, and without the occurrence of anything to which it could be referred, there was noticed a dimness of vision in the left eye, associated with a nasal hemianopsia and accompanied also by a papillitis of a medium grade. The course followed by the affection in this eye was essentially that of the other eye, except that the temporal half of the field in the left eye remained permanently and seriously impaired, while in the right the normal vision was restored in the free portion of the field.

Whatever else may have preceded or followed, we are forced to consider an optic neuritis as the essential pathological lesion. Whether that neuritis was limited to the nerve head (papillitis), or began behind the globe and travelled forward, it was not possible to determine, but it is a fact having an important bearing, that each eye, when first examined, very shortly after the trouble in vision was complained of, showed evidences of a papillitis, though not of a high degree. The connection between the fall and the

appearance of the trouble in the right eye almost immediately afterward can hardly be regarded in the light of a mere coincidence, and yet the defect in the left eye, which appeared some two months later, was not preceded by any such accident. Supposing, as would be the first thought, the lesion in the eye first affected to be a hemorrhage, to connect the trouble in the other eye with the same cause it would be necessary to assume that the hemorrhage, or some consequence of it, had slowly extended from the right to the left side. Unless the progress of the pressure followed a very circuitous route, the intervening tissues between the outer side of the right optic nerve and outer side of the left optic nerve would suffer, and the inevitable consequence must be a total blindness. In many of the cases reported, some such result, or an approach to it, has been the final outcome. That the pressure on the right side has remained limited strictly to the fibres going to the outer half of the retina, as in typical hemianopsia, is shown by the visual field (Fig. 1), which has remained practically unchanged for three years, and the free portion has retained its normal acuteness of vision. On the other hand, the visual field of the left eye does not present a picture of typical nasal hemianopsia, the dividing line running some 15° to the nasal side in some parts of its course (Fig. 2), and the free field has its normal visual acuteness very much reduced. The lesion in the left eye is, therefore, more extensive, and the nasal fibres of the nerve are affected as well as the temporal, though in a less degree.

Assuming then a blood-clot, or some pathological process set up by it, as the original cause, how could it operate to bring about the conditions as they exist to-day? So far as the right eye is concerned, the assumption is easily justified by accepting a clot on the outer side of the right nerve trunk making pressure which limits itself to the temporal-supplying fibres. This might be remarkable, but it is still possible. By what path, however, did this process pass over to the left nerve, leaving the nasal-supplying fibres intact in the right eye, on the supposition that the same cause did bring about the condition in both eyes? This

could be effected only by imagining the clot or inflammatory exudate passing from a or a' (Fig. 4), either above or below the right nerve trunk, traversing the intervening space without interfering with anything, and again appearing on the temporal side, at b or b' , on the left nerve. The tumor or exudate would have, under these circumstances, a form somewhat like this , or this . A lesion

in the tract is possible, too, in spite of the opinion of Gowers, for while we do not know the exact path of the temporal-supplying fibres beyond the chiasma, it is generally conceded that they lie more dorsally than in the nerve trunks,¹ and we can easily see that a lesion at the dotted line a''' (Fig. 4), lying on the dorsum of the right tract and affecting the temporal fibres, which have here changed their position occupied at a' , could extend itself horizontally and finally affect the temporal fibres b''' in the left tract without necessarily interfering with the other fibres. It must be said, however, that against such a supposition must be brought the fact that there was no other manifestation of a cerebral lesion than the hemianopsia, barring the headaches. At no time was a paresis of any cranial nerve noted. Another fact which might militate against such a supposition is the very early appearance of the papillitis in each eye. It might be claimed, however, that this was intercurrent, and due to the gross lesion in the brain, and was independent of the retrobulbar neuritis, which was the real lesion in the hemianopsia. Certainly a neuritis no severer than in this case could hardly have produced the effects that followed. The papillitis was not localized to the temporal side, as we might properly expect it to be for the production of nasal hemianopsia, but general, as was the consequent atrophy.

It must be acknowledged that the direct connection of the phenomena in this case with a definite pathological state has not been clearly demonstrated, any more than in

¹ The latest researches of Dimmer (*Gräfe's Archiv*, B. xlviii., Ab. 3, 1899) confirm this in the main, though he finds an intermixture of the crossed and uncrossed fibres, apparently increasing as the central termination of the tracts is approached.

most of previously reported cases, but it is hoped that some of the facts and observations herewith presented may aid in a further, fuller study of an interesting subject.

Postscript.—After the manuscript of the foregoing paper was sent to the printer, the patient died, on October 15, 1899. He was taken with an attack of semi-unconsciousness on September 31st, followed by aphasia and agraphia, but no paralysis. From this he recovered, at least partially, and I saw him on October 9th, and examined the visual fields carefully, finding them approximately as at the examination in May. After this he had some general symptoms indicating a pyæmic condition, and an abscess in the perineal region developed. For this he was sent to Garfield Hospital by Dr. Hickling, his physician, for surgical treatment. He grew rapidly worse, his aphasia deepened, and he died apparently from a general pyæmic infection. To my profound regret I was not informed of his death, and most unfortunately no examination of the cranial cavity was made at the autopsy.

TUBERCULOSIS OF THE CONJUNCTIVA.

By J. W. H. EYRE, M.S., M.D.,

BACTERIOLOGIST TO CHARING CROSS HOSPITAL AND LECTURER ON BACTERIOLOGY IN THE
MEDICAL SCHOOL; OPHTHALMIC SURGEON TO ST. MARY'S CHILDREN'S HOSPITAL; LATE
SENIOR OPHTHALMIC ASSISTANT TO GUY'S HOSPITAL.

(With Plates IX. and X. of Vol. XL., German Edition.)

THE records of authenticated cases of tuberculosis of the conjunctiva are so few, and the total number of cases is stated to be so small, that additions thereto can hardly fail to be of interest.

Early observers, in blissful ignorance alike of the specific *causa causans* of tuberculosis and the pleomorphism of its resulting lesions, published but few cases of this nature; but since Koch's work on the tubercle bacillus, which among other points indicated the assistance the clinician might gain from the result of inoculation experiments in suitable animals, the list has expanded considerably—the great majority of the cases, however, being recorded by our German confrères.

The rarity of primary tuberculosis of the conjunctiva is now being less insisted upon, and I venture to assert that as more attention is directed to this condition, it will be found to occur fairly frequently.

In 1881 Hirschberg stated that the relative frequency of cases of tuberculosis of the conjunctiva to the total number of new cases was 1:6000. This, it must be remembered, was before the time that bacteriology was able to render any material aid to ophthalmology. A few years later (in 1885), when the extent—and limitations—of this aid was still only imperfectly realized, Mules put the ratio at 1:30,000.

From my own experience, both sets of figures would appear to err in making the condition a rarer one than is actually the case, for in 1897 I recorded 8 cases out of a total of 25,000 new patients.¹ To them I now propose to add 3, making a collection of 11 met with during the course of six years and out of a total number of 31,000 new cases (and I am quite prepared to believe that there have been one or two more that have escaped detection among the remaining 30,989), these figures giving us a ratio of about 1:2700. Moreover, as these figures reach a point where the "error of averages" tends to become a negligible quantity, the condition will probably be found to be even commoner than this ratio would indicate.

In view of these data, the scanty space devoted to this subject by most authors appears to me to be totally inadequate. For example, in the third volume of Norris and Oliver's *System*, tuberculosis of the conjunctiva is dismissed in about a page and a half, and mention is made of one only of the many well defined phases assumed by the disease.

Now Sattler, in 1891, carefully described no less than four groups of cases differentiated by broad clinical and macroscopical features. These he suggested might form the basis of a practical classification—a classification recapitulated below, with slight modifications; and opposite to each group I have placed a short note of its microscopical peculiarities.

GROUP I.

CLINICAL APPEARANCES.

Characterized by the presence of one or more small miliary ulcers, which usually caseate, and may or may not coalesce; these generally attack the palpebral in preference to the bulbar conjunctiva.

MICROSCOPICAL APPEARANCES.

Scrapings from these ulcers used to prepare cover-glass films and suitably stained, say by the Ziehl-Neelsen method, generally show numerous small groups or bunches of bacilli indistinguishable morphologically in their tinctorial reactions from the tubercle bacillus.

¹ Eyre, "Tuberculosis of the Conjunctiva," *Trans. of the Ophthalmological Soc. U. K.*, vol. xvii., 1897.

GROUP II.

Characterized by the presence of grayish or yellowish subconjunctival nodules, varying in size, but rarely larger than a hemp seed—resembling somewhat the sago granules of acute trachoma when gray; or the tubercles met with in the lungs of acute miliary tuberculosis when yellow is the prevailing tint. (I am satisfied in my own mind that this group is but the initial stage of the next, and that these small tubercles, increasing in size by a proliferation of the small round-celled exudation which encircles the giant-cell systems, absorb their conjunctival covering; the continued action of the central irritant is responded to by a like activity of the cell elements, and as growth tends to take place along the lines of least resistance, the fungating granulations of the IIIId Group are the inevitable result.)

Sections of the small miliary tubercles show well-defined giant-cell systems (Fig. 1); and scattered here and there, without any definite arrangement or relationship to these giant cells, small groups of tubercle bacilli, seldom numbering more than ten or a dozen individuals, can usually be demonstrated.

GROUP III.

Characterized by the presence of florid hypertrophied papillæ and rounded flattened outgrowths of granulation tissue, sometimes

Sections of the hypertrophied papillæ and flattened granulations as a rule show nothing but masses of small round cells with occasional

derived from the tarsal conjunctiva, but usually springing from the fornices (resembling in many respects the velvety granulations met with in tuberculous arthritis), and associated with œdema and thickening of the lids.

large polygonal cells, but no definite giant-cell systems (Fig. 2). Tubercle bacilli are usually scattered but very sparsely throughout the tissue, and it generally happens that they are missed. In any case one must be prepared to examine scores of sections, and even then have to record a negative result.

GROUP IV.

Characterized by the presence of numerous pedunculated "cockscomb" excrescences in the fornices, of a jelly-like consistence, and often showing more or less extensive superficial ulceration.

Sections of the jelly-like masses occurring in this group consist, like the granulations of Group III, of masses of small round cells, but show in addition a large proportion of newly formed blood-vessels of the embryonic type (Fig. 3). As in Group III, it is difficult to demonstrate the tubercle bacillus in the sections.

GROUP V.

Characterized by the presence of a distinctly pedunculated tumor (very rarely, more than one may be present) having the macroscopical appearances of a papilloma or fibroma of the tarsal conjunctiva.

Sections of the tumor generally show a stroma of fairly dense connective tissue, enclosing a mass of round cells, with here and there giant-cell systems (Fig. 4); and in these systems, or in close proximity thereto, may be found tubercle bacilli, either isolated or in small bunches of five to ten individuals.

Hence it will be seen that a microscopical examination of the diseased tissue often affords but little help in diagnosis, and in such a case one must resort to an inoculation experiment for further assistance.

The animals usually selected for the purpose are the rabbit or the guinea-pig, and the seat of inoculation is either the subcutaneous tissue of the groin in the case of the latter animal; or the anterior chamber of the eye in the former.

Of the two animals the guinea-pig is generally conceded to be the more susceptible to the tubercle bacillus, dying of general tuberculosis some six, eight, or ten weeks after inoculation. On the other hand, if tuberculous material be introduced into the anterior chamber of a rabbit's eye, an iritis which is almost pathognomonic follows in from fourteen days to a month (see Fig. 7). The wide time limits, like those quoted in the case of the guinea-pig for death from general tuberculosis, depend upon two factors, the one, the virulence of the *B. tuberculosis*, the other the number of organisms introduced. In this connection I may mention the experiments of Wyssokowitsch, who (using tuberculosis sputum) found that the fewer organisms inoculated into a guinea-pig the longer the course of the disease before it was terminated by death; and also that if too few (less than 150) tubercle bacilli were inoculated into the rabbit, tuberculosis was not set up.

Now as the course and progress of a case of tuberculosis of the conjunctiva usually points to a strain of the tubercle bacillus of low virulence, and as one knows from microscopical examinations of material from such cases the bacilli are none too numerous, it follows that as large a piece as possible of the diseased conjunctiva should be used for inoculation purposes.

With these few preliminary remarks I will pass to the description of the three new cases.

CASE 1.—Susan C—, aged seven, first came under observation Oct. 19, 1898, suffering from inflammation of the right eye.

History.—Father died a few weeks back of phthisis. Mother alive and well.

The grandmother states that the child has always been delicate

and ailing; that during the last six weeks the right upper eyelid has "drooped," the outer part of the lid has been swollen, and a little mattery discharge comes from the eye.

On Examination. General.—Patient is a fair, delicate looking child, not over-well nourished. Some bronchitis is present, but there is no evidence of tubercle of the lungs.

Local.—Right eye. There is a distinct thickening of the right upper eyelid, limited to its outer half, together with some ptosis which considerably decreases the size of the palpebral fissure; there is no pain or tenderness.

The right preauricular gland is swollen and hard, and shows as a distinct lump in front of the ear. The skin is not implicated and the gland is freely movable over the deeper structures. It is neither painful nor tender to the touch.

On everting the upper lid, the outer half of the conjunctival surface is seen to be much injected and of a livid hue. It is thickened and elevated from the presence of a small conjunctival nodule lying transversely to the direction of the Meibomian glands.

Scattered throughout this portion of the lid and contrasting with it in a striking manner are numerous yellow "pin's-point" specks.

The bulbar conjunctiva is unaffected; the cornea is normal. Left eye normal.

TREATMENT AND PROGRESS.

Oct. 19, 1898.—Ordered to bathe the eye with a simple boracic lotion, thrice daily. Ext. malti ferrati, 3 i, ter die exhibited.

Oct. 27th.—The diffuse hyperæmia of the ocular aspect of the upper lid has given place to a localized circular patch about 4 mm in diameter, situated at the junction of the middle and outer thirds.

The preauricular gland appears to have increased in size, and the skin over it is somewhat reddened.

Nov. 2d.—Most of the yellowish points in the diseased conjunctiva have increased in size but even now do not attain a diameter of a millimetre. Ulceration of the conjunctiva has commenced in three separate spots—one in the centre of the injected area and the other two towards the lower part of its periphery.

Nov. 9th.—The three minute ulcers noted Nov. 2d have now coalesced and form a small circular ulcer, some 3 mm in diameter,

surrounded by a narrow hyperæmic zone. The edges of the ulcer are slightly everted and undermined, and the base shows numerous minute bright yellow dots, and readily exudes a sanious fluid when touched with a probe.

The preauricular gland is now tender to the touch.

Nov. 22d.—The patient was admitted into the St. Mary's Children's Hospital.

Nov. 23d.—A. C. E. was administered, and the ulcerating area and the tissue immediately surrounding it was thoroughly scraped with a small sharp spoon—at one spot at the centre almost the entire thickness of the tarsal cartilage being removed. The lid was then turned down, and a cold boracic compress applied for a few hours.

Nov. 27th.—The patient was discharged. The operation wound has practically granulated up, and looks well. Ordered to bathe the eye with lot. hydrarg. perchlor. (1 in 4000), three or four times a day.

Nov. 30th.—The site of the ulcer is slightly depressed, but otherwise appears normal.

The preauricular gland is less in size and no longer tender.

Dec. 14th.—The palpebral conjunctiva appears perfectly normal.

The preauricular gland of the right side is no longer to be seen or felt.

May 30th.—Eye remains normal.

BACTERIOLOGICAL EXAMINATION.

1. A coverslip film preparation was made from a portion of the scrapings from the ulcer. This, stained by the Ziehl-Neelsen method, exhibited numerous bacilli, morphologically identical with the tubercle bacillus, of fairly large size and having a moniliform appearance.

2. The remainder of the scrapings were introduced into the subcutaneous tissue of the groin of a young guinea-pig weighing 220 grammes. Five weeks later (*Dec. 30th*) the guinea-pig was dead; *post-mortem*, tubercle bacilli were found in a focus of suppuration at the seat of inoculation, and in the enlarged inguinal glands. Numerous small tubercles were also present in the omentum.

CASE 2.—Benjamin Y—, aged eighteen, clerk. First came under observation November 25, 1898, and was admitted to Guy's

Hospital two days later as suffering from tuberculosis of the conjunctiva.

History.—The family history is good. None of patient's relatives or friends suffer from consumption. Patient works eight to ten hours per diem in a small, badly ventilated office; one of his fellow-clerks suffers from a "winter cough."

Three weeks ago patient noticed that his right upper eyelid was swollen, and that he was unable to open the right eye to the same extent as the left; also that the sight of the left eye was failing.

Condition on Admission: General.—Patient is a tall, thin lad, far from robust-looking. Heart and other organs normal. No evidence of tubercle in the lungs.

Local.—Right eye. The upper lid is swollen and œdematous, pitting slightly on pressure, and the subciliary sulcus is obliterated. The cutaneous surface is of a dusky red color. The palpebral fissure, owing to the patient's inability to raise the lid, is distinctly reduced in size as compared with that of the other side.

The right preauricular gland is enlarged, hard, and firm; not adherent to the skin of the face, and freely movable over the deep structures; neither painful nor tender on pressure. One of the submaxillary glands, of the same side—that at the angle of the jaw—is also much enlarged.

On everting the upper lid, the conjunctiva is seen to be thickened and hyperæmic, and studded with numerous enlarged follicles of a purplish hue. The anterior edge of the retrotarsal fold shows numerous "warty-" looking masses of granulation tissue of fair size, the largest, situated about the middle, being about 5 mm in diameter. The granulations in this neighborhood are roughly circular in shape, with constricted bases and expanded, flattened summits—mushroom-shaped. The conjunctiva lining the upper fornix appears to be unaffected, beyond perhaps some slight engorgement of the vessels passing down on to the globe (Fig. 5).

The bulbar conjunctiva is practically normal, cornea unaffected. Vision = $\frac{6}{8}$. No hypermetropia.

Left eye $\left\{ \begin{array}{l} \text{Tissues normal.} \\ \text{Vision} = \frac{6}{8} \text{ c. } \frac{+4 \text{ D sph.}}{+1.5 \text{ D cyl. ax. } 125^\circ} = 1\frac{1}{2} \text{ pt.} \end{array} \right.$

TREATMENT AND PROGRESS.

Nov. 27, 1898.—Immediately on admission, sol. cocainæ hydrochlor., 4 per cent., was instilled, and some of the prominent

granulations snipped off with curved scissors for microscopical examination. The eye was ordered to be bathed frequently with lot. acidi borici, and malt extract administered internally.

Dec. 1st.—A general anæsthetic was administered (A. C. E.). The right upper eyelid was everted and the retrotarsal fold excised in one piece, together with the narrow strip of conjunctiva covering the upper border of the tarsal cartilage which forms its anterior edge. No sutures were inserted; the lid was simply turned back and the eye closed by means of a pad and bandage.

Dec. 3d.—The pad and bandage were removed and a small eye-shade substituted. Patient had no pain though he complained of a feeling of stiffness when trying to move the lid or eye. Ordered to bathe the eye three times a day with lot. hydrarg. perchlor. (1 in 5000).

Dec. 7th.—Patient was discharged. The site of operation was marked only by a linear scar. There appeared to be no loss of mobility of the globe.

The preauricular gland was less in size and not so hard.

Dec. 20th.—Two small fleshy granulations have made their appearance, one at the middle and the other at the outer extremity of the scar.

Dec. 30th.—The granulations above mentioned, having increased in size, were removed to-day, under cocaine, by means of curved scissors, and the site of attachment of each scraped with a sharp spoon.

The preauricular gland could no longer be made out.

The submaxillary gland has also undergone resolution.

January, 1899.—No further trouble was experienced.

April, 1899.—Patient appears quite normal in respect to the affected eye.

BACTERIOLOGICAL EXAMINATION.

1. The small piece of granulation tissue removed on Nov. 27th was divided into two portions. (a) The one was fixed in a saturated solution of corrosive sublimate, hardened in alcohol, embedded in paraffin, and cut in serial sections in a plane vertical to the bulk of the granulation. Some twenty of these serial sections were mounted on each of twelve slides and stained for tubercle bacilli. On one slide a small bunch of perhaps ten bacilli was found; two or three isolated bacilli were all that were seen in the remainder of the

slides. On staining with borax carmine and picronigrosin, the tissue was found to consist for the most part of masses of small round cells and developing blood-vessels, with an occasional giant cell, and a few definite tubercle systems.

2. The remainder of the tissue was introduced into the subcutaneous tissue of the groin of a 300-gramme guinea-pig. On Jan. 10, 1899 (six weeks after inoculation), the animal was found to be dead. It weighed barely 100 grammes, and *post-mortem* presented a typical picture of general tuberculosis.

3. A piece of granulation tissue removed on Dec. 1st (practically half of one of the largest "mushroom" granulations, and about equivalent to a two-millimetre cube) was thoroughly washed in several changes of sterile broth. A. C. E. was administered to a large rabbit (weighing some 2000 grammes), and after flushing out the conjunctival sac with sterile salt solution for some five minutes, a linear incision was made in the upper part of the periphery of the right cornea with a triangular keratome, and the iris incised whilst in the act of withdrawing the knife. The diseased tissue was now introduced through the corneal wound and allowed to rest over the wound in the iris. The conjunctival sac was again thoroughly washed out. Two days later the lips of the corneal incision had united, there was practically no conjunctival injection, and the anterior chamber had reformed. A certain amount of exudation had taken place from the wounded iris, binding the piece of granulation tissue, which was now quite white, firmly down to that membrane. During the following week absorption of the foreign mass proceeded apace. On the ninth day after inoculation, however, a marked circumcorneal zone of injection was present, the iris was muddy and inactive, and the fundus reflex was dull. The mass of tissue in the anterior chamber was pinkish in color and new vessels could be made out on its anterior surface. Two days later the animal was killed with CHCl_3 , the affected eye excised, frozen, and bisected vertically in its antero-posterior axis so that the section passed through the centre of the foreign tissue. One half was mounted in gelatin, the other prepared for

microscopical examination. *Post-mortem*,—a caseous gland was found in the right side of the neck which contained a few tubercle bacilli.

Microscopical examination of the sections prepared from the rabbit's eye showed that the adventitious tissue had become blended with the anterior surface of the iris. The central portion formed a roughly circular nucleus of dense fibrous tissue whilst the entire periphery was infiltrated with small round cells; and here and there the formation of elementary "giant-cell systems" could be observed. The search for tubercle bacilli gave a negative result. It would therefore appear that owing to a mistaken idea as to the severity of the condition of the eye, the animal was killed too early.

CASE 3.¹—Percy L.—, aged fourteen. First came under observation on Feb. 3, 1899. Patient was then in one of the general surgical wards of Guy's Hospital, having been sent in for treatment of suppurating glands of the left side of the face and neck. A fortnight later he was transferred to the eye wards for (?) tuberculosis of the conjunctiva.

History.—The family history is good. Both parents alive and healthy; ditto brothers and sisters. No history of phthisis. Three months ago patient noticed a small swelling in front of the left ear; one month later another appeared just below the angle of the jaw on the same side. (A little before the first appeared patient says that his right eye was noticed to be swollen, but this quickly passed off.) Patient was taken to the family doctor, who opened the tumor in front of the ear, and let out some "thick yellow stuff." As the wound thus made did not close, but continued to discharge, and the second swelling "burst," patient was sent up to the hospital.

TREATMENT AND PROGRESS.

Feb. 3, 1899.—A. C. E. was administered and the cavity caused by the suppurating preauricular gland thoroughly scraped, the infiltrated skin around the opening excised, and the wound closed by continuous horsehair sutures. The gland below the jaw was

¹ I am indebted to Dr. Brailey for permission to report this case in its entirety.—J. E.

dissected out and this wound similarly closed. Both were dressed with carbolic gauze.

Feb. 6th.—Wounds dressed; incisions are healing although there is some discharge from each. The left eye was examined and granular conjunctivitis—trachoma—diagnosed.

Feb. 9th.—Wound below jaw healed but that in front of the ear still discharging. All stitches removed. (The preceding notes were abstracted from the Surgical Clerk's Report.)

Feb. 16th.—Patient transferred to the eye wards.

Condition on Admission: General.—Patient is a pale, weakly looking lad, although fairly well nourished. No evidence of tubercle in the lungs or elsewhere.

Local.—Left eye. Both lids pallid—slightly thickened but not œdematous.

On drawing down the lower lid, many small yellow nodules are seen scattered over the palpebral conjunctiva and a few grayish ones, chiefly to the outer side, and especially aggregated towards the outer canthus. Whilst the yellowish dots are precisely similar to these seen in acute miliary tuberculosis of the lung, the gray ones more nearly resemble the discrete granules of an early trachoma.

On everting the upper lid, numerous small red "mushroom" or "button" granulations, slightly constricted at their bases, are noticed arranged in a line over the upper edge of the tarsal cartilage. The largest of these is perhaps 4 or 5 mm in its longest diameter. Towards the outer angle may be noticed several of the yellowish tubercles, similar to those in the conjunctiva of the lower lid (Fig. 6). The vessels of the bulbar conjunctiva are but slightly injected. Cornea normal. The situation of the preauricular gland is marked by a small circular sinus, some 8 mm in diameter, which is suppurating profusely.

Feb. 17th.—Under cocaine, two contiguous yellow nodules were removed from the conjunctiva of the lower lid, for bacteriological examination.

Feb. 24th.—A. C. E. was administered. The lids were everted and all the prominent nodules and granulations removed by the aid of curved scissors. Next, their bases and the surrounding portions of the conjunctiva were thoroughly scraped with a sharp spoon, the lids replaced, and the eye bandaged for a few hours.

March 3d.—Two small granulations have sprung up at the outer part of the conjunctival surface of the upper lid. These were completely removed under cocaine.

Patient discharged.

March 8th.—The inner surface of each lid appears to be invested by normal conjunctiva—a good example of the vitality of this membrane, and its remarkable powers of regeneration even after the destruction of large areas.

The preauricular sinus has completely healed.

May, 1899.—Patient remains perfectly well.

BACTERIOLOGICAL EXAMINATION.

1. The scrapings and granulations removed by the operation on Feb. 24th were carefully preserved, thoroughly washed in warm sterile broth, then fixed in corrosive solution, hardened in alcohol, and embedded in paraffin in one mass. Sections were cut and mounted serially, and stained for tubercle bacilli, but although I examined considerably over a score of slides, each having 4–8 serial sections mounted thereon, I was unable to satisfy myself as to the presence of the tubercle bacillus. Stained with borax carmine and picronigrosin, the small nodules had each the structure of a typical miliary tubercle, with central giant cells.

2. A rabbit weighing 1270 grammes was anæsthetized by means of A. C. E., and incision made with a triangular keratome in the upper corneal margin of the right eye; next a small triangular piece of iris was excised, midway between the free and attached margins.

The tubercles removed from the conjunctiva (Feb. 17th) were introduced through the corneal incision, and, with a fine pair of forceps, passed through the wound in the iris into the chamber existing behind the base of the iris, and between it and the anterior surface of the lens, and pushed a little to the temporal side of the orifice so that it should not fall forwards into the anterior chamber of the eye. The entire operation was conducted with strict regard to asepsis, and was completed within thirty minutes of the removal of the tissue from the patient's conjunctiva, the nodules being placed during the preliminary steps in a capsule containing sterile broth at the temperature of the body.

Two days later the eye is noted as quite quiet, the corneal incision closed, and the orifice in the iris occluded by lymph.

The position of the piece of (?) tuberculous conjunctiva is indicated by a slight bulging forwards of the iris, to the nasal side of the patch of lymph.

During the next month but little change took place locally, although the animal steadily declined in weight until by the 5th of April (just over six weeks from the time of inoculation) it had lost 195 grammes. On this day also the iris was first noticed to be muddy and injected, and three minute yellow spots were detected on the pupillary margin of the iris.

On April 11th, the cornea is uniformly hazy, and in consequence the fundus reflex is dull. The whole iris is puckered up into ridges and furrows, radiating from the pupil. The three minute tubercles noted five days ago have increased to nearly double their previous size, and in addition, a large nodular mass occupies the nasal half of the posterior surface of the iris, and shows yellow through that organ (Fig. 7).

April 13th.—The animal to-day weighed but 1000 grammes. It was killed with CHCl_3 , the right eye excised, bisected horizontally through its antero-posterior axis, the section passing through the large yellow mass; one half was mounted in gelatin, the other prepared for microscopical sections.

Post-mortem.—The emaciation, the glandular enlargement, the presence of tubercle bacilli in the glands of the neck and axilla (which were all that were examined microscopically), and the caseous nodules in the spleen made up an absolutely typical picture of general tuberculosis.

Microscopical examination of the sections prepared from the rabbit's eye showed that each of the small yellowish dots noted during life had the structure of a typical tubercle with its central giant cell or cells surrounded by zones of epithelioid and lymphoid cells; tubercle bacilli could also be detected in and near the giant cells.

The large yellow mass which formed an integral portion of the base of the iris was also tuberculous in character, and showed signs of commencing caseation at its centre. Infiltration of the ciliary body by small round cells was in active progress, and tubercle bacilli were plentiful throughout the entire mass.

CONCLUSIONS.

1. Cases of primary tuberculosis of the conjunctiva occur in the proportion of at least 1:2700; probably more frequently.

2. Primary tuberculosis of the conjunctiva is usually unilateral.

3. It occurs either as a caseating ulcer, or as an inflammatory new formation of the granuloma type—if as the latter it belongs to one or other of four clinically distinct groups.

4. It is extremely chronic, and exhibits no tendency to undergo spontaneous cure.

5. It does not usually tend to implicate the cornea until quite late in the disease and the iris later still.

6. The preauricular gland of the same side as the affected eye is infected early, and then the next glands in the series, viz., those below the angle of the jaw.

7. If untreated, the conjunctival lesion will probably serve as the primary focus from which the bacillus tuberculosis will become disseminated to distant organs.

8. Removal should be thorough, and should be undertaken as early as possible. Under such circumstances, like other localized tuberculous lesions, a permanent cure may be confidently expected.

9. With regard to the microscopy of the disease, in the case of the ulcer, tubercle bacilli can generally be demonstrated by suitable means in the “scrapings”; but where the lesion is of the nature of a granuloma, it is rather the exception than the rule to detect the organisms in sections of the tissues, but in such cases the experimental inoculation of a portion of the diseased tissue into the anterior chamber of a rabbit's eye or the subcutaneous tissue of a guinea-pig will rarely fail to prove a positive result (so far in my hands this method of diagnosis has never failed).

Plate I.

FIG. 1.—Section of conjunctival tubercle (Group II.), with central giant cells— $\frac{1}{8}$ in. objective, and 8 ocular.

FIG. 2.—Section of granulation tissue outgrowths (Group III.),

showing small round cells and few polygonal cells— $\frac{1}{4}$ in. objective, and 6 ocular.

FIG. 3.—Section of gelatinous “cockscomb” excrescences (Group IV.), showing small round cells, and numerous embryonic type blood-vessels— $\frac{1}{4}$ in. objective, and 4 ocular.

FIG. 4.—Section of conjunctival tumor (Group V.), showing the small cells in fibrous stroma; also giant-cell systems towards the free edge— $\frac{1}{4}$ in. objective, and 6 ocular.

Plate II.

FIG. 5.—Tuberculosis of the conjunctiva, Group III. (See Case 2, Benjamin Y——.)

FIG. 6.—Tuberculosis of the conjunctiva, Groups II. and III. (See Case 3, Percy L——.) Note the unusual combination of the miliary tubercles of Group II. in the lower lid, with the fungating granulations so characteristic of Group III. in the upper.

FIG. 7.—Tuberculous iritis in the rabbit—resulting from the inoculation of a portion of the diseased conjunctiva from Case 3.

I am indebted to the facile brush of my friend, Dr. T. G. Stevens, of Guy's Hospital, for the faithful, and at the same time artistic, representations of the clinical appearances contained in these last three figures.

THE SUCCESSFUL TREATMENT OF THREE IMPORTANT CASES OF DISEASE OF THE EYES BY THE COMBINED METHOD OF HG AND KI INTERNALLY AND PILOCARPINE HYPODERMICALLY.¹

BY G. HERBERT BURNHAM, M.D., TOR.; F.R.C.S., EDIN.;

ASSOCIATE PROFESSOR OF OPHTHALMOLOGY AND OTOTOLOGY, TORONTO UNIVERSITY; OCULIST AND AURIST TO THE GENERAL HOSPITAL, TORONTO, ETC.

IT is my intention particularly to mention three cases,—one of cyclo-iritis of both eyes, of long duration, with the other changes in the eyes usually associated with the long continuance of this disease; a second of iritis of both eyes, with typical diffuse scleroderma; and a third of complete paralysis of the left third nerve, from acquired specific disease.

These I bring forward as exemplifications in a most marked degree of the great value of my combined form of treatment, viz., mercury and the iodide of potash given internally and pilocarpine hypodermically.² To these I could add minor cases. At present I have just received under my care a very severe case of rheumatic cyclo-iritis of each eye with vision, good perception of light only; also a case of inflammation of the ciliary region, retina, choroid, vitreous, leading to almost total destruction of vision of one eye and less, though marked, affection of the same structures of the other. This has been caused by masturbation, practised a good many years by a young man, twenty-six years of age. I have also another of acquired specific iritis of both eyes;

¹ Read before the Canadian Medical Association, at Toronto, Aug. 31, 1899.

² See ARCH. OF OPHTHAL., xxvii., p. 175.

one, the right, made a permanent recovery ; but the left has had for one year or more frequent relapses, thus preventing the man from returning to his employment. The pupil is unable to dilate fully, owing to iritic adhesions. He is now for the first time under my care, and I am using my combined treatment for the sole purpose of putting a stop to these relapses, which I am fully persuaded it will.

CHRONIC IRIDO-CYCLITIS.

My **first case** is an unmarried woman, fifty-eight years of age. The family history seems to be fairly good. In the spring of 1896, the R eye became inflamed for one week. It then became quite quiet, but at the end of one month the left eye became inflamed, and has had similar attacks on and off ever since. The R eye had also during this time suffered, but not nearly so severely.

She consulted a specialist in the spring of 1897. He used my combined form of treatment for seven injections. The eyes were quieter that summer. In the winter, 1897-98, there were, on and off, severe attacks of inflammation. In the summer, 1898, thirty injections of pilocarpine were given. During these injections she had, she said, several attacks of inflammation of the eyes.

With my experience regarding this case, the combined treatment, then tried, failed because it was wrongly given. She continued the use of internal remedies till November, 1898, when she consulted me for the first time. The condition was then as follows :

Left eye : no perception of light, T —, very shallow anterior chamber, and the tissue of the iris infiltrated and covered with a dull whitish exudation, which also involved the pupillary area, so that no details of the tissue of the iris and the pupillary area could be made out—that is, a dull grayish, homogeneous mass covered entirely the iris and pupillary area.

Right V = less than $\frac{2}{3}$ 0, T +, halos at times, pupil contracted and margins held by fine exudation. A dull, white patch of exudation showed in the pupil and reached down behind the iris, apparently unattached to the pupillary margin ; at the upper margin the same condition, but the exudation smaller in size.

My combined form of treatment was begun at the end of the

first week in November, 1898. Fifteen hypodermic injections of pilocarpine were given.

December 16, 1898.—R V = $\frac{2}{200}$ and $\frac{2}{100}$; she says the sight is clearer and the halos are less marked; Tn. full.

February 2, 1899.—Returned for another series of injections. R V = $\frac{2}{100}$. The injections were begun but discontinued in a few days as a very severe attack of follicular tonsillitis set in. R eye at once became painful and a little injected, T +, and the two patches of dull, whitish exudation before mentioned came out from behind the iris and passing through the pupil lay in the anterior chamber well down in front of the iris, but still attached at one end behind the iris. This attack, the only one experienced since the beginning of my treatment, lasted but a few hours. With its cessation the lymph patches again went back into their former position and the eye became quiet. This short-lived attack has been the only one up to the present time, that is, August, 1899, and seems in some way to have been connected with the tonsillitis.

May 27th.—R eye V = $\frac{2}{8}$ less one letter, Tn.

L Tn. full, no p. l.

Now the iris tissue can, for the first time, be seen in some places. Where previously a uniform grayish membrane only could be made out, now the tissue of the iris can be distinctly seen.

She returned August 7, 1899, for another series of injections.

R eye V = $\frac{2}{70}$, Tn.; eye quiet since her last visit.

L Tn., no p. l. The clearing-up process still progresses most satisfactorily.

This left eye will, of course, never regain perception of light, but the unmistakable evidence of improvement in this lost, degenerated eye again puts beyond dispute the radical and far-reaching effect of this treatment. With respect to this case I was more sceptical regarding the results to be got from my treatment than any other I had yet met with. However, the treatment is having a most beneficial effect, and pursuing exactly the same course for the next two, three, or four years, I expect to be able to chronicle another decided success.

My **second**, a man, a Jew, William D., aged forty-eight years, is a most typical case of advanced diffuse *scleroderma with iritis in*

each eye. The iritis was marked by fine posterior synechias and a thin covering of lymph on the anterior capsule of the lens. The sight was very poor.

He was put under my combined form of treatment the latter part of December, 1898. At present the iritis is very much improved, and the vision decidedly better. As to the scleroderma, in that there has been a steady, uninterrupted change for the better, till now it has reached a stage of improvement which forms a most striking contrast to the pitiable and apparently hopeless condition he was in when I began. This patient is shown in the skin clinic organized in connection with this meeting and held in St. Michael's Hospital, so that you all can see him. I may mention that I have been informed that previously this patient had been an inmate of some of the most prominent hospitals in the United States. I would like the treatment to be tried in lupus and kindred affections.

My **third case** is of a different type. The specific disease was contracted four years ago and was under treatment for some time.

For about nine months before consulting me the iodide of potash was given. At the end of this time there came this total paralysis of the left third nerve. The patient went to bed apparently in the usual good health. In the morning on arising the eye felt queer, and by nightfall the paralysis, from what I learn, was complete.

At the end of one week I was consulted. After a delay of two weeks I began my combined treatment. I gave fourteen hypodermic injections. At the end of the twelfth, that is, at the end of thirteen days, there was an increase in the movement upwards of the eyelid and a slight movement inwards of the eyeball. One week later, the injections being now stopped, the eyelid could be raised a full two-thirds of the normal amount and the eyeball could be brought to the median line and held there. Three weeks after the first, the second series of injections, seven in number, were given. Diplopia is at six feet. At any greater distance the vision is single. Three weeks later there remained only a very slight drooping of the eyelid, and the patient could walk comfortably with both eyes open, up to this time being unable to do so on account of the confusion of images. Two weeks later diplopia is not now made out till the object is at the distance of ten inches. The progress after the use of my combined treatment I consider most rapid, viz., in eight weeks from the beginning of this treatment

no diplopia till the distance of ten inches from the eyes was reached. I have no notes since that date, that is, six weeks ago, as the patient has not put in an appearance.

As to the method of administration, my previous articles have, I think, fully dealt with that. I shall only say, tuck well in the bed-clothes along the whole spine from the occiput downwards; and in cool or cold weather put a hot bottle to the feet. Two symptoms of a proper effect are very free perspiration and the free flow of saliva, viz., six fluid ounces to one pint. As to the length of time to continue these recurring series, I name no special limit, but do always advise to go on as long as there is any improvement. In my minor and easily managed cases a few months will suffice, whereas in my severe ones I have continued them for three or four years.

There is one peculiarity in this treatment,—that is, that no relapses occur, even in cases in which under the forms of treatment previously used they have recurred frequently and severely. The nerve centres, especially what we term the absorptive system, are most profoundly and directly acted upon in this treatment. Especially marked is this stimulated condition of the nerve centres during the first few hours after the injection. Hence the great necessity of exercising the care I am ever insisting upon.

Having thus been able to produce the effect upon the diseased tissues which I have drawn attention to, it follows that to keep up the desired action we must go on using the remedies, and hence the consistency of advocating their methodical administration, and in severe cases their long-continued use.

In cases of old iritis where there is much damage to the vision through the effusion and organization of lymph, I never do an iridectomy. Instead I cause its absorption by my method with far better vision than by any other procedure, operative or otherwise. In my earliest papers I said that any other organ or part of the body ought to be as easily influenced by this treatment as the eye. This case of iritis with diffuse scleroderma most satisfactorily emphasizes and bears out this contention of mine. It ought to

encourage the members of the profession to give my treatment a fair and impartial trial.

In the eye minute changes for the better can very quickly be seen, whereas if the eye were much less easy of observation, a much longer time for the recognition of an improvement would be needed. This must not be forgotten when my treatment is applied to other organs not so easily observed as the eye. Hence patience must then be exercised, as an improvement may sometimes have been going on for quite a length of time before the observer has the changed condition drawn to his attention. This combined form of treatment applies equally to *syphilitic* and *non-syphilitic* affections.

After the many years of close observation regarding this treatment, I now feel that I can, and have a right to, speak emphatically as to its assured, and I might almost say unique, position.

A CASE OF EXTENSIVE DETACHMENT OF THE
RETINA IN A MYOPIC EYE IN WHICH COM-
PLETE RECOVERY FOLLOWED REST IN
BED AND THE ADMINISTRATION OF PILO-
CARPINE.

By SAMUEL THEOBALD, M.D., BALTIMORE.

CLINICAL PROFESSOR OF OPHTHALMOLOGY AND OTOTOLOGY, JOHNS HOPKINS UNIVERSITY.

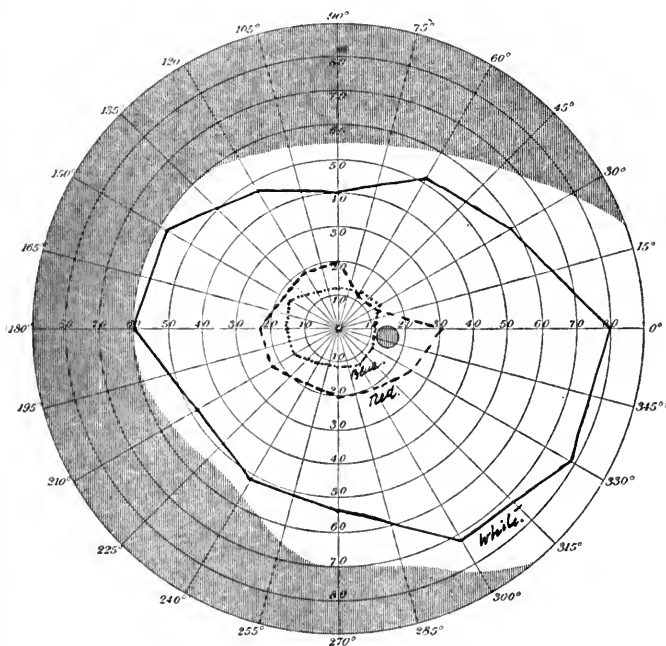
(*With a text illustration.*)

NOTWITHSTANDING the rather extravagant claims which have recently been put forth as to the success obtained in the treatment of detachment of the retina by operative procedures more or less novel, it may still be held, I think, that complete recoveries from this very grave condition, especially recoveries occurring in highly myopic eyes, are sufficiently rare to justify one in reporting even a single case of this character.

By way of preface, I may remark that it is not claimed that the successful outcome of the case which I purpose briefly describing was necessarily a *consequence* of the treatment adopted. Probably it was; but we should not lose sight of the fact, generally recognized, that spontaneous recoveries are met with from time to time. If there is any lesson to be drawn from the case, it is the importance of commencing the treatment of retinal detachments at the earliest possible moment.

A point of interest is the remarkable change which occurred in the refraction of the eye during the stage of re-attachment of the retina. There is good reason to believe that before the occurrence of the detachment there was a myopia in this eye of 7.50 to 8. D. At one period during

the convalescence, when central V had reached $\frac{10}{LXXV}$, there was a manifest hypermetropia of 4. D (a + 4. s lens actually giving the best obtainable vision), indicating a shortening of the distance between the cornea and the retina in the region of the macula of approximately $3\frac{1}{2}$ mm. This condition, as might be supposed, was a transient one, and as the



retina became more closely applied to the other coats of the eye the myopia returned, and gradually increased to 4. D and later to 5.50 D.

Summarized as briefly as possible, the history of the case is as follows :

L. A. H , æt. fifty, American, accountant, was first seen at the Baltimore Eye, Ear, and Throat Charity Hospital, May 20, 1898. Four days previously, upon awakening in the morning, he had observed a marked defect in the vision of the right eye, before which eye, a week earlier, he had noticed floating motes. There was no history of traumatism. The ophthalmoscope showed extensive detachment of the retina, the detachment being especially

marked upwards and outwards and being so extensive as to preclude a view of the papilla. Vision was reduced to mere ability to detect movements of the hand in the upper and outer portion of the field, central vision being practically nil. Pilocarpine muriate was prescribed, to be taken by the mouth, in increasing daily doses, beginning with gr. $\frac{1}{4}$. Five days later the patient was taken into the hospital, where he was kept for five weeks, being confined to bed for the first two weeks of his stay. The administration of the pilocarpine was continued for two weeks after his admission to the hospital, the maximum dose reached being half a grain once a day. At the time of his discharge the retinal detachment had diminished markedly and he had $V = \frac{1^0}{LXXV}$, with central fixation. A week later (July 6th) he was put upon small doses (gr. v. three times a day) of potassium iodide, which were continued regularly for four weeks, and afterwards, at intervals, for some weeks longer. August 24th, a careful ophthalmoscopic examination revealed no detachment of the retina, but showed, what had previously been noted, a rather large floating opacity in the posterior portion of the vitreous humor. The vision of this eye had now improved to $\frac{2^0}{XC}$ with -2.50 s. October 14th, the myopia had increased to 4.D and the vision had improved to $\frac{2^0}{LXX}$. April 23, 1899, a test of the vision showed a further slight improvement ($\frac{2^0}{LX}$ —) and indicated a $M = 5.25$ D. The accompanying chart shows the field of vision taken at this date. The color fields, which are noteworthy because of their limited area, especially the field for blue, were taken one week later. The vision was tested last on June 30, 1899, and was then $\frac{2^0}{LX} +$ with -5.50 s, and the visual field was rather better than when taken in April.

A recent ophthalmoscopic examination (Oct. 25th) showed no trace of the former detachment. The floating vitreous opacity was still present, but beside this there were only the appearances characteristic of a decidedly myopic eye—a conus of moderate size with general thinning of the choroido-retinal pigment.

He is now, and has been for some time, using his eyes moderately in near work and experiences no especial inconvenience; and, as more than fourteen months have elapsed since the retina became reattached, the prognosis as to the future is, I think, distinctly favorable.

A FURTHER CONTRIBUTION TO THE VALUE OF THE X-RAYS IN DETECTING METALLIC PAR- TICLES IN THE EYE, WITH REMARKS ON OTHER METHODS.

BY A. B. KIBBE, M.D., SEATTLE, WASHINGTON.

IN a previous article,¹ I reported a number of cases in which the X-rays had been of great value in locating particles of iron within the eyeball. Since that time, enlarged experience with the method has served to strengthen my belief in its value, and I now beg leave to add to the number then reported several more, and to make a critical comparison of this method with others more or less in common use.

CASE 1.—R. E. H., farmer, consulted me September 16, 1897. Ten weeks previously, while hammering a piece of iron, a particle flew from the hammer and struck his right eye; vision gradually failed, until at the time of visit it was reduced to perception of light. Examination showed an opaque lens, closed pupil, and subsiding iritis. Faint cicatrix near the upper edge of cornea. Radiograph shows foreign body in upper anterior half of globe. Under anæsthesia lens was removed after making a wide iridec-tomy. Tip of magnet introduced into anterior chamber failed to withdraw the particle. Recovery with thick opaque capsule in pupillary area. Eye free from irritation. No tenderness in ciliary region. Second radiograph shows foreign body in same location. Returned three months later with eye still in good condition. Patient was informed of probable final outcome, but was willing to take all responsibility and retain the eye as long as possible.

CASE 2.—Geo. C. consulted me October 18, 1897. Left eye

¹ These ARCHIVES, vol. xxvi., No. 4.

was injured ten days before by particle flying from iron wedge which he was driving into a log. Lens opaque. Iritis, complete closure of pupil, slight exudate in bottom of anterior chamber, faint linear scar midway between centre and lower edge of cornea. Radiograph shows foreign body in either lower part of anterior chamber or anterior portion of lens and close to limbus. Anæsthesia, incision at limbus inferiorly. On introducing tip of magnet, a click was heard and a small particle of steel removed. An iridectomy was made and softened lens removed as far as possible. Ten days later, patient, who was very unruly and disagreeable, left the hospital. Not seen again.

The two following cases are examples of the absence of foreign bodies, when their presence might readily have been suspected.

CASE 3.—C. W. S. was brought to my office by his brother in the evening of October 26, 1897. He had been struck in the left eye the previous day by a piece of iron flying from a casting which he was hammering. Examination showed a horizontal wound in the upper portion of the cornea four millimetres in length. Anterior chamber filled with blood. He had no idea of the size of the piece which had struck the eye, but thought it must have been a large one. A radiograph was at once taken, which showed the absence of any metallic particle. The eye was dressed antiseptically, the patient sent to the hospital and ordered to remain in bed. A week later, the blood having been absorbed from the anterior chamber, and the lens being swollen with particles protruding into the anterior chamber, linear extraction was performed. Recovery uneventful.

CASE 4.—W. G. W., machinist, consulted me March 8, 1898. While cutting an iron rod with a cold-chisel, twenty-four hours previously, a piece flew and injured his right eye. Vertical wound about five millimetres in length near temporal edge of cornea, anterior chamber filled with blood. Radiograph gave negative result. Eye washed with hot boracic acid solution, lids cleansed, and aseptic dressing applied. Recovery with vision $\frac{3}{4}$.

CASE 5.—W. J. B., April 12, 1898. Three days previously, while knocking an iron hoop from a barrel, something flew and struck him in the left eye. For twenty-four hours vision was not greatly affected, then pain began and sight grew less. At the time of his visit to me vision was reduced to fingers at three feet.

The aqueous was hazy and pupil contracted. Surrounding the inner third of cornea was an area of chemosis. No wound visible. Patient stated that he was quite certain the particle had not penetrated the eye, as it must have been too large, judging from the shock of the blow ; it had nearly knocked him down. (This is a common statement, as all know who see many of these injuries, and not at all reliable for diagnostic aid.) Radiograph showed the body to be a long chip located in upper and inner quadrant and lying with its long axis antero-posteriorly, its posterior end being apparently embedded in the retina. Having eaten a hearty meal shortly before the radiograph was taken, and it being late in the evening, operation was postponed until the following morning. Under anæsthesia the sclera was bared at a point midway between internal and superior recti and some distance back of the limbus. Here an incision about six millimetres in length was made through the sclera and the point of the electro-magnet carefully introduced between the lips of the wound. A click was instantly felt and, on withdrawing the magnet, the particle was seen adhering to the tip. Its shape corresponded very accurately to the image on the plate, which might almost have been a photograph of the body. Ten days later the patient left the hospital with the eye free from irritation and with vision equal to fingers at three feet ; six weeks later vision was the same. No details of fundus visible. Patient has not been seen since.

CASE 6.—Chas. E., machinist, consulted me May 9, 1898, for an affection of his right eye, stating that the sight began to fail six weeks previously. For several weeks he had been under the care of a specialist, but the eye becoming inflamed and painful, he desired further advice. Examination showed a dilated pupil, evidently from atropia, with what appeared to be a traumatic cataract, portions of the swollen and opaque lens pressing against the cornea. He could not remember to have been injured, though in his work it was common for particles of metal to strike the eye. These, when embedded, were usually removed by one of his fellow workmen. Feeling confident that the eye contained a foreign body, a radiograph was made the same evening. It showed very clearly the presence of a metallic particle, evidently in the lens. The following morning, at the Seattle General Hospital, under anæsthesia, the anterior chamber was opened, and, with the electro-magnet, a minute chip of steel removed from the softened lens. As much of the latter as would come away was easily

extracted, and one week later, the remainder. Recovery smooth, with ultimate vision of $\frac{2}{40}$.

CASE 7.—John H., injured one week previously, came to my office July 18, 1898. While striking an iron wedge with a heavy hammer, a piece flew and injured his left eye. Vision was at once destroyed. Irido-cyclitis. From the appearance of the eye over the insertion of the internal rectus, I took it that the particle had entered at that point. Radiograph showed foreign body, spear-head in shape with barbs spread out, in upper and inner quadrant, deep in vitreous. Under anæsthesia an attempt was made to remove it. While the magnet would move the particle, the ends would impinge on the interior surface of the globe and its hold be broken. As the eye was practically destroyed, efforts were abandoned and later enucleation advised, which was refused.

CASE 8.—Henry O., October 13, 1898. Injured three weeks previously by particle flying from iron wedge. Iritis, pupil contracted. In lower part of anterior chamber a peculiar-looking purulent exudate, differing from an ordinary hypopyon in that the pus arose in the centre in the shape of a whorl the apex of which reached nearly to pupil, which was blocked by lymph. Very faint scar on cornea midway between limbus and centre. Radiograph shows foreign body apparently in anterior chamber. Under anæsthesia an incision was made at the limbus inferiorly and the tip of the electro-magnet introduced. The click of adhering metal was at once felt, but the body was not withdrawn. The lips of the incision, which was a wide one, were then separated by a German silver spatula and the tip again introduced. It at once adhered to the particle and with quite a perceptible pull was withdrawn with the particle attached to its extremity. Irritation rapidly subsided and the patient recovered with vision $\frac{20}{60}$.

CASE 9.—Mrs. R., November 12, 1898, while watching a log being split by an iron wedge which was struck with a heavy sledge-hammer, suddenly felt a sharp pain in the right eye. Vision at once became blurred and the eye painful. Twenty-four hours later she consulted me. The pupil was contracted and partly filled with lens matter. Atropia was instilled, but pupil responded only feebly at upper half. Radiograph failed to show foreign body. The same evening, under anæsthesia, preparatory to opening the anterior chamber, which I felt contained the particle, the large blunt tip of an electro-magnet was placed in contact with

cornea and slowly moved upward. With the starting of the magnet a scale of metal followed it from behind the iris into the pupillary space. A wide incision was then made at the limbus upward and the piece removed by the magnet. So thin a scale I have never seen. Rubbing it between the finger and thumb, its presence could not be felt. This readily explains why the radiograph failed to show it. The thin edge was in a line with the rays. It is the only instance in which the X-rays have failed me. Iritis of moderate severity ensued, resulting in dense capsular opacity.

CASE 10.—A. J. B. consulted me April 9, 1899. He stated that he had been injured three weeks previously by something striking his left eye while hammering a piece of iron. The physician who attended him is said to have removed a foreign body, but pain and failing vision caused him to seek further assistance. Examination showed marked siderosis, pupillary space occluded by lymph, aqueous cloudy. At inner and lower quadrant of cornea faint cicatrix and an appearance which might be taken for a foreign body. Radiograph was attempted, but the patient's timidity was so great that but one exposure was made. This showed a minute particle below the centre of the eye, but every detail was so blurred that I could not be certain as to exact depth. The following morning, under anæsthesia, the anterior chamber was opened by an incision downward, but no foreign body detected by magnet. Six days later, the patient being assured he would not be injured by the rays, a second attempt was made to obtain a radiograph. Two exposures were made on the same plate. This gave quite clearly the location in lower inner quadrant and posterior to lens. Under anæsthesia, a T-shaped incision was made through sclera at the point indicated, *i. e.*, between internal and inferior recti and about seven millimetres posterior to limbus. The steel was extracted at the second attempt without loss of vitreous. Ultimate recovery with vision $\frac{2}{3}$.

CASE 11.—Wm. D., miner, was referred to me by Dr. J. H. Koons, of Dawson, N. W. T. While sharpening a pick a piece flew from the hammer and injured his right eye. This occurred July 26, 1899. For two days vision was not perceptibly impaired, but on the third day the eye became painful and the sight was rapidly lost. In that remote region, the centre of the Klondike gold-fields, there were no facilities for treating such injuries, and he was referred to me. After a journey of nearly two thousand

miles he reached Seattle, August 12th. Examination showed a wound one millimetre back of limbus in upper and outer quadrant. Pupil a long oval, the greater diameter of which was toward the wound, into which the iris had prolapsed. No reflex from fundus. Downward and outward a whitish-yellow mass was seen, evidently exudate surrounding the particle. Vision, perception of light; irido-cyclitis. Radiograph taken that evening showed metallic particle in lower outer quadrant. Assisted by Dr. Alfred Raymond, I bared the sclera at a point between external and inferior recti, about eight millimetres back of limbus. Here a T-shaped incision was made, and the blunt tip of the large electro-magnet described in these ARCHIVES, vol. xxviii., No. 2, gently placed at the lips of the wound. The patient at once complained of great pain, but the particle did not appear. It was again used, and this time introduced just within the wound; on carefully withdrawing it the eye bulged for some distance around the incision, and I thought the particle must be a very large one. Suddenly there shot from the opening a mass of exudate adhering to the magnet, fully as large as a small bean. Embedded in this was a piece of steel.

Removing this particle was, under the circumstances, a forlorn hope as far as restoring vision was concerned, but as the other eye was practically useless, owing to extensive choroidal disease existing since childhood, the attempt was justifiable. From the time he entered my office in the evening until the eye was dressed and he was ready to be taken to his home, was one hour and ten minutes. In this time the radiograph was taken, the plate developed, fixed, and given a preliminary washing. Dr. Raymond, who assisted me, and to whom I telephoned, came from his residence, a distance of nearly a mile; dressings were prepared, instruments sterilized, and the operation performed. I mention these facts, as the statement has been made by Hirschberg¹ that the X-rays are too complicated and require too much time to be of value.

In all these cases the method of locating the foreign body was by taking two radiographs on the same plate, the tube being moved a short distance from its primary position in

¹ *Die Magnet-Operation*, p. 8.

making the second exposure. As a "finder," a large pin was placed in a piece of adhesive plaster, and this made to adhere to the closed lids in a vertical position. Care was of course taken that the middle of the pin coincided with the centre of the cornea. In this way two images were obtained.

The position of the body relative to the pin gives us, first, a very accurate estimate of its depth in the eye; second, nearly as accurate an idea of its position with regard to the horizontal meridian, whether above or below it; and lastly, a close approximation of its position relative to the vertical meridian, as, if the two images of the body are more widely separated than are the images of the pin, we can be certain the body was nearer the source of illumination. If separation is less, we know the body must have been farther removed and closer to the plate. The pin having occupied the position of the vertical meridian as closely as possible, we can see almost at a glance whether the particle is to the inner or outer side of this meridian. In this way we can locate the body with fairly great accuracy by simply glancing at the plate if it be a good one and properly developed. *Precise location of a foreign body within the eye, not directly visible, is impossible by any known method.* Nor is such location necessary for successful treatment. All that is absolutely required is a knowledge of its approximate depth, its position relative to the vertical meridian, whether to the inner or to the outer side, and whether above or below the horizontal meridian — in other words, its depth and in which quadrant of the eye it lies. This, I think, will not be denied by any one who has had much experience in the removal of foreign bodies from the interior of the eye.

That the proper use of the X-rays will furnish us this information has been abundantly demonstrated within the past two years by many observers. How closely these requisites are furnished by other methods may be seen from a consideration of their character.

First may be considered the sideroscope of Asmus. That this instrument is of great value cannot be denied by the adherents of any method. Just how accurate it is in the

hands of one skilled in its use may be seen by reference to a recent publication by Hirschberg.¹

When all conditions are complied with, particles of iron may be detected in any one of the four quadrants of the eye, in the lens or posterior to it. Its disadvantages are, however, many and serious. Thus the extreme sensitiveness of the magnetic needle necessitates its being far removed from any masses of iron. For this reason it should be set up in a room especially devoted to its use and which should be bare of other furniture than that necessary to the apparatus. In clinics in the large cities this may be done, but for the ophthalmic surgeon's private practice in the smaller places this would almost debar him from its use, as cases requiring its aid are not so very common, certainly not enough so to justify the added expense. According to Linde² the current from electric cars run by either the overhead or underground trolley system renders the apparatus useless during the time the cars are passing. Asmus also states that the masses of iron in vehicles passing the building in which the instrument is located interfere seriously with accurate reading. While bodies may be located with fairly great precision, we derive no knowledge of their shape and only an approximate idea of their size, as a small particle close to the surface will exert as great an influence on the needle as a larger one farther removed.

The only other method worth considering is that in which the large magnet is used and which by its traction on the foreign body causes the sensation of pain or dragging, or produces visible changes in the ocular tissues, bulging of iris or sclera. This method, while having a certain value in the absence of either the X-rays or the Asmus sideroscope, is so uncertain and may at times be so dangerous that personally I feel it should only be mentioned to be condemned as a method for general use. It has a value, as have all methods, one might say, but it is very slight and restricted to very exceptional cases. No knowledge of the location of the body is furnished us, nothing as to shape or size, and

¹ *Die Magnet-Operation in der Augenheilkunde*, 1898.

² *Centralblatt für praktische Augenheilkunde*, September, 1898, S. 262.

its dangers are many when used for this purpose. A large rough particle in the vitreous may be dragged against the ciliary processes so forcibly as to bruise and set up a severe inflammation, or it may become entangled and resist every effort at removal when the eye is opened. As an example of what might have occurred had this method been used, take Case 5. Here the particle was long and jagged. Approaching this eye to the large magnet would have resulted in the particle, owing to its size, being powerfully attracted to the anterior part of the globe and forcibly pressed against lens and ciliary body. From this position smooth extraction would have been improbable, if not impossible. Aside from these objections, it is not at all reliable, for the patient may perceive no sensation when the magnet is approached to the eye and yet an iron chip be present. Cases of this kind are not uncommon.

Knapp¹ reports three instances. Hirschberg² cites several cases, and in a footnote makes this remark: "The statement that the large magnet is the best diagnostic aid is false. In numerous cases, as in this one, the finest splinter was indicated by the sideroscope, while the large magnet failed to produce any sensation when applied to the eye." As a reliable and scientific method, therefore, I think we are justified in dismissing from consideration the use of the large magnet as a sideroscope. The question then lies between the X-rays and the sideroscope of Asmus.

The objections to the former are mainly that their use is generally assumed to require a technical knowledge of electricity and to some extent of photography. This is more imaginary than real. As the apparatus is now furnished, no knowledge of electricity is requisite, at least no more than one can acquire in a few days' reading. The developing of plates is so simple that a few lessons from a photographer will enable one of ordinary intelligence to acquire the ability to do this for himself. As far as time consumed is concerned I think there is little difference between the two methods. Plates may be kept ready in holders if necessary, and the

¹ ARCHIVES OF OPHTHALMOLOGY, vol. xxviii., p. 172.

² *Loc. cit.*, p. 87.

taking of the radiograph, developing and fixing the plate, may all be done in twenty minutes. All the information obtainable may be had from the plate after fixing better than in the finished print, so that no time need be lost in this respect.

Radiographs may be taken in broad daylight, as well as in darkness, in one's office—as I do—as well as in a specially arranged room. In fact the use of the apparatus takes but little more time than does the thorough testing of the visual fields with a perimeter. By the use of the newly introduced Wehnelt interrupter, coils for Röntgen-ray uses may be greatly simplified and the cost decidedly lessened. Where coils giving ten- to fifteen-inch sparks were formerly required, the same work can now be done with those giving from six to ten. No assistant is required.

In my opinion, from what has been said by the most ardent advocates of the Asmus sideroscope, as well as from the statements of those who have tried and discarded the instrument, and from theoretical considerations, it is unsuited to the wants of the private practice of the ophthalmic surgeon. Where room can be had in a large clinic, it may find a place, but I venture to predict that the majority of those who require an instrument for the detection and location of iron particles within the eye will ultimately provide themselves with an X-ray apparatus and depend on it solely for such purpose.

TREATMENT OF CORNEAL ULCERS AND CORNEAL FISTULÆ BY ELECTROLYSIS.

By FRANK CORNWALL, M.D., SAN FRANCISCO, CAL.

UPON a recent visit of my esteemed teacher, Dr. David Webster of New York, he took occasion to remark that a townsman of mine, Dr. Martinache, first published the treatment of indolent ulcers of the cornea by galvano-cautery. Upon my remark that I employed electrolysis instead, he asked a description of my method. He then suggested that I have it published.

I shall report only three cases as illustrative ones. I will state that I have given this treatment a trial in phlyctenular ulcers of the cornea, and that the results have always been to aggravate the condition. The indications for the use of electrolysis are those in which galvano-cautery is employed. It is not sufficient to say that it may be administered in any case in which the process of repair is slow or inefficient, as this occurs in phlyctenular ulcers of the cornea.

There are ulcers of the cornea which are not phlyctenular, that at times have the appearance of being progressive, yet which remain for weeks characterized by slight if any invasion, and in which photophobia and reflex neuralgia are very great. Electrolysis is indicated in these cases and also in what are called serpiginous ulcers. Its broadest field of usefulness, however, compared with any other method, is in chronic central ulcers which are very slight, the repair being almost complete. The lack is in the epithelium, which is at best imperfect. Slight causes create relapses, when there will be great photophobia, pain, etc. Every oculist is

familiar with this kind of case, so I hope my meagre description will answer the purpose.

In the treatment of this case the voltage must be very low and the ampereage not more than $\frac{1}{4}$ milliampere. Operating under a magnifying-lens, the parts where the epithelial disturbance is greatest may be slightly touched with the end of the needle. If there are parts wherein Bowman's membrane seems involved, deeper and more thorough work will be needed, but caution should be exercised, and not too much done at one sitting.

REPORT OF CASES.

CASE 1.—Miss R., æt. thirty. Applied August 8, 1899. *Torpid corneal ulcer*. Four years ago had corneal ulcer without assignable cause. Result, superficial opacity, and facette 2 mm in diameter. Subsequently the eye remained irritable, with tendency to become hyperæmic on slight use. Nine months ago had a mild relapse, which was slow in recovery. Treated for one month with atropine and mercurial applications with no benefit. Used the electrolytic needle as above directed, which arrested the ulceration, but left the eye irritable. Six months subsequent to the first treatment by this method applied the needle again, and this time more thoroughly. The needle, although very small, was very smooth and rounded at its point, such as used for epilation. Wherever the epithelium seemed imperfect it was touched. Following this there were three or four days of hyperæmia, photophobia, etc., after which there was marked improvement. One month later the treatment was repeated, since when the eye has been perfectly sound and well.

CASE 2.—Mrs. H. *Fistula corneæ*. This case was notable, inasmuch as there was a question of its curability by two oculists of repute.

The opening in the cornea was situated very near the corneal periphery, and was so small that almost the normal tension of the eye was maintained. My method of procedure was as follows: The temper was taken out of a jeweller's broach, the point of which was very slender. Then about one millimetre of its point was bent at a right angle to the main shaft, and after anæsthesia by cocaine, the needle was inserted so that the point rested underneath the cornea. The dispersing electrode was placed

upon the cheek, and the ampere metre was made to read about $\frac{1}{4}$ milliampere. By turning the shaft of the needle the bent angle of the point was made to describe a circle, and thus the proximal surfaces of the cornea and iris were eroded. When this was accomplished the needle was withdrawn, straightened, and with its point the inner surface of the ring was also eroded.

This completed the operative procedure, and took less time than it would to describe it. The eye was properly bandaged and the patient required to rest for a couple of days, when the cure was complete.

CASE 3.—Mr. B., blacksmith. *Central ulcer of the cornea from injury.* Been treated by the family physician three or four weeks, during which time there was great pain and photophobia, in spite of the liberal use of atropine and cocaine. Inspection upon application at my office showed a long and narrow ulcer, which from its history and appearance was caused by a blow, bruising the part.

There was, for about 2 mm of this trough-shaped ulcer, an infiltrated base. Superficial offshoots radiated from the greater trough, a couple of them reaching in irregular directions almost to the corneal periphery. I treated the ulcer for two weeks with varying results with atropine, hot packs, calomel and other mercurial salves, etc. Finally, upon a relapse, I began the treatment by electrolysis. At the time of the first application of this method the pain and photophobia were great. I drew the point of the needle along all the fissures, and gave the part with infiltrated base particular attention. The effect was extraordinary. In half an hour the pain, photophobia, etc., were entirely relieved, and my patient, for the first time in two months, removed the bandage from his eye and walked on the street erect.

REMARKS.

I wish to call particular attention to the position of the dispersion electrode in this procedure, viz., that it should be as near as practicable to the operating electrode. It may seem superfluous. I thought several years ago that I had given electrolysis a fair trial in surgery of the eye and nose, and condemned it in many instances wherein I now get from it the happiest results. This all came from employing a current of too high a voltage, which produced great pain and irritation.

ON THE INJECTION OF A WEAK STERILE SOLUTION OF SODIUM CHLORIDE INTO COLLAPSED EYES.¹

By JOSEPH A. ANDREWS, M.D., NEW YORK.

(With a text illustration.)

AT Dr. Knapp's request, I have written the following note on the injection of a sterile salt solution into collapsed eyes:

In July, 1891, a young woman in the Ophthalmic Division of the City Hospital, Blackwell's Island, N. Y. (she was at the time a prisoner in the Penitentiary, the medical services of which institution belong to the City Hospital), urged me to remove a traumatic cataract which disfigured her left eye. Before examining the eye critically I had remarked to my house surgeon that such eyes were generally unfavorable for operation. The eye had been injured by a blow (not a penetrating wound) more than a year before. There were no signs of active inflammation. The lens was white and opaque and about half its normal size. The central part of the anterior capsule was occupied by a dense chalk-white spot; there were two posterior synechiæ above; the iris and shrivelled lens were tremulous; no nystagmus; tension, by comparison with the fellow-eye, seemed to be about normal. The light projection was good in every part of the field. There was, therefore, reason to believe that the patient had escaped serious complications in the background of the eye; and the hope was entertained that useful vision might be restored, provided the lens could be removed without undue injury to the eye.

¹ A note supplementary to Dr. Herman Knapp's article in these ARCHIVES, No. 3, 1899, p. 308.

In other words, it was not simply a question of removing the lens for cosmetic purposes. Nevertheless, I felt fully prepared for a considerable loss of vitreous during the attempt to remove the lens. The operation was performed under general anæsthesia and anti-septic precautions. The instruments were boiled and the conjunctiva wiped with absorbent cotton dipped in a boiled solution of sodium chloride, the cul-de-sac being afterward irrigated with the same solution. Relatively speaking, as compared with the size of the lens, I made a small corneal flap upward, and excised a piece of iris. The lens was removed, together with the capsule, but not before a large amount of vitreous had been lost. I should say that more than half of the vitreous escaped through the wound. The whole eyeball collapsed. I injected into the globe a quantity of a warm sterile solution of sodium chloride (6-1000). The globe was restored to its shape, and before the dressing was applied the lips of the wound were in coaptation. Fortunately, the operation was done while the patient lay in her bed, so that she escaped the danger which might have been incurred by removing her from the operating-table. I had apprehended that the sudden and great loss of vitreous might give rise to detachment of the retina; for this reason the patient was kept in bed for a longer time than would have been necessary had she escaped serious complications during the operation. The recovery was smooth and uneventful. The resultant vision was $\frac{2}{3} 0$.

This is the only instance in which I have had an opportunity to introduce a solution of any kind into a collapsed eyeball after loss of a large amount of vitreous. I did not publish the case at the time, because I wished to await further experience with the procedure, for I did not feel sure of the extent of its utility in older patients in whom lack of vitality or other causes might materially influence the results sought for. Dr. Knapp's experience seems fully to justify his recommendation of the procedure, inasmuch as his subjects were well advanced in that stage of life when we should expect a less healthy condition of the blood-vessels than would be likely to obtain in a subject of my patient's age, Dr. Knapp's patients having been aged respectively fifty-two and fifty-eight years. Although the above-cited case is the only one in which I have injected the physiological salt solution where the whole eyeball was collapsed, I have for

many years followed the practice of expelling cortical matter from the eye by washing out the anterior chamber with a sterile salt solution (6-1000).¹ I have generally preferred this procedure to the manœuvre of rubbing such matter out of the eyes by means of the lids or stroking the cornea with a spatula, and have reason to believe that I have thus sometimes averted the evil consequences of bruising the iris in eyes prone to inflammation. My experience has been repeated so many times that I can confidently declare that these intraocular injections are wholly free from danger. In June, 1897, assisted by Dr. G. W. Otto, at Santa Barbara, Cal., I extracted a cataract in a man seventy-eight years of age. It was a simple extraction. The lens came out in its capsule. There was no escape of vitreous, but the cornea was wrinkled and collapsed to an extraordinary degree. I closed the lids and waited a reasonable time for the aqueous to reform and restore the shape of the cornea. As this did not take place, a warm sterile salt solution was injected into the anterior chamber. The cornea took its shape sufficiently to place the lips of the wound in apposition. The recovery was smooth. In two similar cases of extraction, done this year, in patients whose ages were respectively seventy-six and eighty-four years, the result of injecting the salt solution into the anterior chamber was equally favorable.

It was a habit of the late Dr. C. R. Agnew, while the patient was being anæsthetized, preparatory to the extraction of cataract, to pinch up a fold of skin on the back of the patient's hand, or elsewhere, and remark to the bystanders, in case there was a greater than usual lack of elasticity in the skin, that we might expect in such cases a similar lack of elasticity in the cornea, and he thought that this condition had an unfavorable influence on the healing process. This is, of course, an old observation, and I know that such cases have usually not done well, because, it seemed to me, the lips of the wound could not be made to apply to each other.

I am not aware that there is any mention in ophthalmic

¹ Joseph A. Andrews, "An Instrument for Syringing out Cortical Matter in Cataract Extraction," *Transactions of American Ophthalmological Society*, July 19, 1892.

literature of intraocular injections for collapsed eyes until last May, when Dr. Knapp published his cases. At the time that I began to inject a sterile salt solution into the anterior chamber to remove cortical matter after cataract extraction, ten years ago, I thought the procedure was a novel one, but I found that solutions had been injected for this purpose early in the century, and the results were, as might have been expected, unfavorable, because the solutions were not sterile. Panas has advised the use of a solution of biniodide of mercury for washing out cortical matter, but this solution was shown to be objectionable. The apparatus which I use for introducing the salt solution into the eye is one which I devised for the purpose several years ago (Fig. 1). It consists of a glass bottle with a hollow glass stopper which is extended into a tube with a fine, smooth, bent extremity. The bottle and stopper being blown (not cast), they permit of ready sterilization of the solution by boiling over a spirit lamp. The solution comes in contact with glass only, it being never necessary to allow the fluid to touch the rubber nipple. Meyer's lachrymal syringe, which Dr. Knapp has used, is open to the objection that it cannot be so readily sterilized. The solution of salt (6-1000) should be filtered through good filter paper (not through cotton), and care be taken to exclude foreign particles, etc.

E. B. Meyrowitz, 104 East 23d Street, New York, makes these bottles.

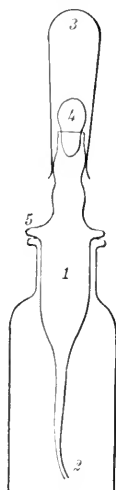


FIG. 1.

One half actual size.

The glass stopper (4) closes the hollow stopper (1) and prevents the fluid in the bottle from becoming contaminated by contact with the rubber nipple (3) when the bottle is not in use; the collar (5) protects the mouth of the bottle from collections of dust, etc. See *Trans. Amer. Oph. Soc.*, 1892.

SERIES OF ONE HUNDRED CASES OF CATARACT EXTRACTION.

BY DR. C. E. FINLAY, OF HAVANA, CUBA.

THE putting into practice by a beginner of the teaching received from a first-class master, may prove interesting and instructive to some of the readers of these ARCHIVES, hence my presentation to them of this report of my first one hundred cataract extractions. These have been performed at several of the general and private hospitals of this city, and at the private residence of a good many of the patients, —the nursing often leaving a good deal to be desired, making the fair amount of success with which they have been attended all the more satisfactory. This I attribute, in great part, to the valuable experience I acquired during my three years' connection with the New York Ophthalmic and Aural Institute, during which I had the opportunity, not only of assisting at almost all the operations of such an expert as Dr. Knapp, but also of following their after-treatment to the end, thus gaining the knowledge of how to meet the different complications that may arise, both during and after the operations, and enabling me to pull through a good many cases which might not otherwise have done so well.

METHOD OF OPERATING.

PREPARATIONS. *Instruments.* — After careful inspection and examination of the instruments as regards their physical cleanliness and condition (sharpness of cutting instruments), I have them boiled for twenty minutes before the operation in a 2 % carbolic acid solution ; from this they are transferred

to a tray with a 3% boric acid solution, from which they are taken as required during the operation. The dishes and trays to be used, I disinfect by burning alcohol in them.

Patient.—The day before the operation I prescribe a purge, and the morning of the same day I have the patient take a bath, and have his head shampooed. Immediately before the operation I thoroughly wash and scrub the skin of lids, temple, forehead, and face, first with soap and water, and then with a 1:1000 solution of bichloride of mercury; special attention being paid to the lid margins and eye-lashes. The eye to be operated on I then isolate from the rest of the head and face by cloths soaked in the same solution. The conjunctival sac is next thoroughly washed out several times with a 1:5000 bichloride of mercury solution.

Surgeon.—I then make my hands and arms aseptic as for any other important surgical operation, by scrubbing with brush and soap and water, and then with a 1:1000 bichloride solution.

Anæsthesia.—I have only made use of local anæsthesia in the shape of a 4% solution of cocaine; I begin to instil it twenty minutes before the operation, repeating it every five minutes till the pupil dilates. It has been perfectly satisfactory, the only disagreeable result, in a few cases, being an exaggerated hypotony which was embarrassing; the drying up of the cornea, which is so frequent, promptly disappears on allowing any fluid to flow over it.

OPERATION.—The technique which I endeavor to follow is that employed in Knapp's clinic during my stay there, viz. :

The eye being anæsthetized, and the instruments, patient, and operator ready, I introduce the speculum, and once more wash the cornea and conjunctival sac with the 1:5000 bichloride solution, and proceed to make the section of the cornea (with a Graefe knife), exactly at the transparent margin, comprising from $\frac{2}{3}$ to $\frac{1}{2}$ its circumference. The next step is Knapp's peripheric cystotomy. The next, the expulsion of the cataract by pressure at the lower corneal margin with Daviel's spoon, and counter-pressure above the upper lip of the wound with the wire loop. The pupillary area is then cleansed, the iris replaced, and the conjunctival

sac and wound washed out with a neutral aseptic solution (boric acid, boiled water); after the section of the cornea, except under extraordinary circumstances, I do not use bi-chloride, so as to avoid staining of the cornea. Pads of aseptic gauze and cotton are then placed over both eyes and a binoculus is applied.

The light employed is ordinary daylight, focused on the eye by means of a hand-lens. It is most important that the illumination be good, as one never knows when an accident may call for extra fine manipulation, such as the introduction of the wire loop into the eye to fish out the lens, a poor illumination being then a great handicap, as I have had the opportunity to find out, on two occasions, to my and the patient's cost.

Iridectomy.—I have only performed an iridectomy under some one of the following circumstances: 1st. When the iris has been injured in the corneal section. 2d. When through stickiness of the lens, or too small a section, difficulty was experienced in expelling the cataract by the usual method, or when necessity arose for manipulations which entailed the introduction of instruments into the posterior chamber, especially when vitreous was lost before the expulsion of the cataract. 3d. When after the expulsion of the lens, the iris showed a tendency to prolapse or resisted replacement.

Under these conditions, the comparison of the results obtained in the cases where iridectomy was performed with those of simple extraction, is not fair and cannot lead to any correct conclusions.

Corneal Section.—One of the most important steps in the operation is without doubt the section of the cornea, and it is the one which a beginner finds most difficulty in executing according to his desire and intentions,—the tendency on his part being to make it too small and too corneal. In younger persons a smaller section than that advocated above may suffice, owing to the smaller size of the nucleus; in persons over seventy, care must on the other hand be taken to make it full size. In a good many of the cases where I had to perform an iridectomy, it was due to some flaw in the section; before resorting to this procedure, I always first tried

if enlarging the wound with the scissors would not answer the purpose. When the section is too peripheric, an iridectomy is also necessary to forestall a subsequent prolapse.

Cystotomy.—I have not found Knapp's peripheric cystotomy, which I always performed, to increase the difficulties of extraction; in some difficult cases it has enabled me afterwards to introduce the wire loop through the tear in the capsule and to extract the lens with it without loss of vitreous (a secondary cataract subsequently forming).

Expulsion of the Lens.—In ordinary cases I have employed the method mentioned above; in others, when some difficulty has been experienced, the external manipulation, the brilliant performance of which by Dr. Knapp all attendants at the New York Ophthalmic and Aural Institute have occasion to admire. When loss of vitreous occurred before the cataract had been expelled, where this was luxated, and in some cases of undue stickiness of the lens (without loss of vitreous), where the two other methods had proved inefficient, I have employed the wire loop. This instrument is almost dispensed with by Dr. Knapp, except for the purpose of applying counter-pressure above the superior lip of the wound. I do not think I have seen him introduce it into the eye more than three times during my connection with the Institute; he supplants it by the above-mentioned manipulation, by means of which I have on several occasions seen him expel a dislocated cataract with no, or a minimum, loss of a fluid vitreous. This is due to his great executive skill and dexterity, which nobody can hope to attain in his first hundred extractions. In these complicated cases, I have, with the wire-loop extraction, lost only a minute amount of vitreous—in a few, none at all; whereas, in the few of these cases in which I have made use of the external manipulation, the loss has been more considerable, and in most cases I have had to fall back on the wire-loop extraction in the end. In this, very delicate operating is necessary, care being taken to pass the loop well behind the lens, then, slowly tilting the lower end forward and pressing the cataract against the cornea, to extract it by gentle traction; the greatest care being in the meanwhile taken that not the

slightest pressure be applied to the eyeball. I have had recourse to this procedure twenty-three times, in eight losing no vitreous. I always precede it by an iridectomy.

Toilette.—Care must naturally be taken to remove the excess of soft cortical matter which often remains behind, especially in cases where the cataract is not quite mature; for this purpose external manipulation is unsurpassed. At times, however, some difficulty is experienced on account of unruliness of the patient or some other cause, and it is then not prudent to insist too much; the lens matter left behind in these cases, I have found to absorb more or less readily, producing very little irritation, if care be taken to maintain the dilation of the pupil with atropine. In these cases secondary cataract is apt to develop sooner. With the washing out of the anterior chamber, I have had no personal experience.

Reduction of the Iris.—There is no compromise in insisting on the necessity of doing this thoroughly, special attention being paid to the angles of the wound. It is quite as important in cases where an iridectomy has been performed, as in those of simple extraction. Where any tendency to prolapse or resistance to reduction exists, an iridectomy should be performed at once.

AFTER-TREATMENT.—I always insist on rest in bed, with closure of both eyes, for three or four days after the operation, differing in this from some of my colleagues, as I consider perfect quiet necessary to the complete success of the operation. The first twenty-four hours I keep the patient on his back, put him on fluid diet, have an attendant or nurse at hand to supply his needs, at night tying his hands to the foot of the bed; prescribing an opiate if the pain, after the operation, be very severe. I always inspect the eye the day after the operation, especially if any pain be complained of; and if there be no prolapse and the anterior chamber closed, I instil atropine. I keep both eyes closed for three or four days, and do not remove the bandage from the operated eye until the seventh to tenth day. After the first day I allow the patient to lie on his sound side. I permit the diet to be more and more solid as the healing progresses, the first few days care being taken to have all the solid food

as finely cut up as possible, to avoid the movement of the whole head which chewing entails. The course of the case guides my further treatment.

ACCIDENTS AND SUBSEQUENT COMPLICATIONS.

Collapse of the Cornea.—This occurred four times in two patients,—one being very old and the other having a “keratoglobus” of both eyes with an excessively thin cornea. The extraction was somewhat more difficult than usual, owing to the excessive hypotony found in these cases. One eye was lost from infection.

Loss of vitreous occurred in 8 cases of simple extraction, in 14 cases of extraction with iridectomy, and in the 2 cases of extraction after preliminary iridectomy. Four of these cases were lost,—1 from panophthalmitis, 2 from cyclitis, and 1 from choroidal hemorrhage; but it is not reasonable to attribute the loss solely to this accident. Loss of vitreous was naturally much more frequent in my first operations.

Iridodialysis occurred in 1 case, owing to a sudden movement of the patient during the performance of an iridectomy. The final result was not affected by the accident.

Choroidal hemorrhage, involving the loss of the eye, as regards sight, occurred in 1 case some twelve hours after the operation (no suppuration). A similar accident had occurred in the other eye several years before, after an extraction by a brother oculist.

Prolapse of Iris.—This *bête noire* of simple extraction, which almost invariably was traumatic, occurred eleven times after these operations, and six times after extraction with iridectomy. In the former cases the prolapse was abscised immediately in six cases, and in one after six weeks. With regard to the dealing with this complication, I followed the precepts of my teacher, viz., excision, if seen within the first twenty-four hours of its occurrence; expectation and possibly later abscission, if seen later; it is principally with the object of finding out if this complication has occurred, that I inspect the operated eye the day after the operation. As a rule, when it occurs it does so in the first two or three days, but I have seen it as late as the tenth. In none of the

eyes that were lost did prolapse occur, nor did any untoward result follow an abscission.

Iritis occurred five times after simple, and seven after combined, extraction. As a rule, it was more or less mild, and yielded readily to atropine; at times it was, however, more severe, in three cases bringing about a closure of the pupil, necessitating further operative interference.

Cyclitis, involving the loss of the eye, occurred in three cases of extraction with iridectomy.

Panophthalmitis was the result of two extractions with iridectomy.

SECONDARY OPERATIONS.

Discission.—No cataract extraction can be considered complete,—unless the lens has been extracted in its capsule,—till a discission has been performed, as, even if excellent vision be primarily obtained, at the end of a few months, or a year or two, this will have materially diminished, on account of wrinkling, thickening, and opacification of the capsule, this not being then in as good a condition for discission as in the first two or three months. I therefore consider the operation indicated in almost every case, even with as good a vision as $\frac{1}{4}$ $\frac{5}{10}$, although in these cases it is difficult to obtain the patient's consent. I use in its performance Knapp's discission needle, and operate by artificial light. I have performed it twenty-seven times after simple, fourteen times after combined, iridectomy, and once after an extraction with preliminary iridectomy. I have met with no accidents; in the two cases where the ultimate vision was less than that before the discission, this was due to extraneous causes.

Iridectomy for closure of the pupil was performed four times in three patients; three times without appreciable benefit.

Iridotomy for the same purpose was performed twice,—once with a moderate amount of success; both patients had been previously iridectomized. The two last operations are mostly "forlorn hopes," hence the poor results obtained.

Extraction of Secondary Cataract was performed with good result in one case, where discission had proved ineffectual.

RESULTS.

In estimating the results of my cataract extractions, I have separated the non-complicated from the complicated cases. In the former, the visual results have been my guide; the latter have each been judged on its own merits. These visual results, after the primary operation, I have considered good, when superior to $\frac{1}{200}$; moderate, when between $\frac{4}{200}$ and $\frac{15}{200}$; and failures, when below $\frac{4}{200}$. Those after the secondary operation I have considered good, when a decided benefit was obtained by the operation; moderate, when there has been little or no benefit but no harm has been done; and failures, where the vision, after the secondary operation, was less than before.

RESULTS.

PRIMARY OPERATION.	Good.	Moderate.	Failure.	Total.	SECONDARY OPERATIONS.	Good.	Moderate.	Failure.	Total.
<i>Simple Extraction :</i>					Discission	28	12	2	42
Non-complicated cataracts	47	5	1 ¹	53	Iridectomy.....	..	1	3	4
Complicated cataracts..	5	2	..	7	Iridotomy.....	..	1	1	2
Total.....	52	7	1	60	Extr. of Sec. Cataract...	1	..	..	1
					Total.....	29	14	6	49
<i>Extraction with Iridectomy :</i>									
Non-complicated cataracts	21	2	4 ²	27					
Complicated cataracts..	7	3	1 ³	11					
Total.....	28	5	5	38					
<i>Extraction after Prelim. Iridectomy :</i>									
Complicated cataracts..	2	..	..	2					

Thus, in the 100 extractions, there were :

82 good results,
12 moderate results,
6 failures.

100

¹ From choroidal hemorrhage. ² Two cases from panophthalmitis ; two from cyclitis. ³ From cyclitis, with closure of the pupil.

TABULATED REPORT OF CASES.

N.O.	NAME—AGE—HEALTH.	CHARACTER OF CATARACT.	OPERATION—HEALING.	PRIM. V.	SECONDARY OPERATION.	ULT. V.	REMARKS.
1	Juan Garcia. 64 yrs. Alcoholism. Syphilis.	Mature. Durat. 5 yrs. L. E.	Simple extraction. Loss of vitreous (after expulsion of lens). Healing normal.	$\frac{1}{5}$ $\frac{4}{5}$			R. E. previously successfully operated by Dr. S. Fernandez. 4 yrs. after extraction chorio-retinitis specifica (both) with ultimately consid. dim. in S.
2	José Sanchez. 60 yrs. Good.	Almost mature. Durat. 1 yr. R. E.	Extr. w. Irid. Slow clos. ant. ch.	$\frac{1}{3}$ $\frac{1}{3}$	Discission.	$\frac{1}{2}$ $\frac{5}{6}$	Irid. due to inj. of iris in section.
3	Maria de Jesus Polanco. 80 yrs. Good. (Negress.)	Complicated. Poor projection. R. E.	Simple extr. Healing normal.	$\frac{1}{5}$ $\frac{2}{5}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	L. E. cataract. No. P. of L.
4	Miguel Gastamienza. 53 yrs. Good.	Mature. R. E.	Extr. w. Irid. Ang. prolapse on 10th day (traum.).	$\frac{1}{5}$ $\frac{5}{6}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	Irid. on account of tendency to prolapse.
5	Ramona Inclan. 45 yrs. Good.	Mature. R. E.	Simple extr. Healing normal.	$\frac{1}{5}$ $\frac{5}{6}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	
6	Jimena Pichardo. 65 yrs. Weakly. (Mulatto.)	Mature. R. E.	Simple extr. Healing normal.	$\frac{1}{5}$ $\frac{5}{6}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	
7	Rosario Valdes. 60 yrs. Good. (Mulatto.)	Hypermat. Durat. 16 years. L. E.	Simple extr. Lens expelled in capsule (imperf. cystotomy), loss of vitreous, iris folded back. Healing : sm. ang. prolapse.	$\frac{1}{5}$ $\frac{5}{6}$			
8	Rosario Valdes. 60 yrs. Good. (Mulatto.)	Hypermat. Durat. 16 yrs. R. E.	Extr. w. Irid. Ang. impacations.	$\frac{1}{5}$ $\frac{5}{6}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	Irid. due to tendency to prol. Later V. decreased to $\frac{1}{10}$.
10	Rafaela Calzado. 45 yrs. Good.	Almost mat. Durat. 1½ yrs. L. E.	Ext. w. Irid. Moderate iritis.	$\frac{1}{5}$ $\frac{5}{6}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	
9	Rafaela Calzado. 45 yrs. Good.	Mature. Durat. 2 yrs. R. E.	Simple extr. Slow clos. ant. ch.	$\frac{1}{5}$ $\frac{5}{6}$	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	Iris injured in section.
11	Venancia Pacheco. 44 yrs. Syphilis.	Soft. Complic. L. E.	Simple extr. Loss of vitr. (lens and some vitr. escaped immed. on sect.). Healing : impaction of iris.	$\frac{1}{5}$ $\frac{5}{6}$			R. E. had been previously successfully operated on by Dr. Lopez. 3 mos. after extr. severe iritis (R.) recovery. 2 yrs. later severe choroiditis (both), recovery, w. S., R. = O., L. = $\frac{1}{10}$.
12	Bonifacio Varona. 77 yrs. Atherom. arts. Urine=alb.	Almost mature. Durat. 1 yr. L. E.	Simple extr. Sm. central prolapse.	$\frac{1}{5}$ $\frac{5}{6}$ Estimated	Disc.	$\frac{1}{5}$ $\frac{5}{6}$	

13	José Quintana. 43 yrs. Good.	Complic. traumatic. Durat. 1 yr. R. E.	Extr. after prelim. Irid. Laborious extr. w. wire loop, slight loss of vitr. Healing normal.	$\frac{1}{10}$			Cataract ex. for body in iris wh. removed 1 year before. 2 years after extr. detachment of retina.
14	Miguel Gastamienza. 54 yrs. Good.	Mature. L. E.	Extr. w. Irid. Panophthalmitis.	V. = O.			Irid. due to inj. to iris in section.
15	Martin G. Setuain. 64 yrs. Good.	Morgagnian. Durat. 5 yrs. L. E.	Simple extr. Loss of vitr. Extr. w. wire loop. Healing normal.	$\frac{1}{10}$			Fundus perfectly clear. Irregularity in distribution of pigment.
16	Manuel A. de la Fuente. 68 yrs. Good.	Mature. Durat. 5 yrs. R. E.	Simple extr. Healing normal.	$\frac{1}{10}$	Disc.	$\frac{1}{10}$	
17	Pedro Padron. 67 yrs. Loss of pat. reflex. Beriberi. (Chinaman.)	Mature. R. E.	Extr. w. Irid. Loss of vitr. Extr. w. wire loop. Healing normal.	$\frac{1}{10}$			Irid. to facil. extr.
18	Blas Blanco. 80 yrs. Good. (Negro.)	Mature. Durat. 5 yrs. L. E.	Simple extr. Lens expelled in capsule (imperf. cystotomy), mod. loss of vitr. Healing normal.	$\frac{2}{10}$			
19	Ignacio A. Rodriguez. 53 yrs. Good.	Almost mature. Durat. 1 yr. L. E.	Extr. w. Irid. Loss of vitr. Extr. by ext. manipul. Loss of consid. vitr. Healing; slight iritis.	$\frac{1}{10}$	Disc.	$\frac{1}{10}$	Irid. after loss of vitr. to facil. extr.
20	José Lopez. 51 yrs. Good.	Morgagnian. Durat. 2 yrs. L. E.	Extr. w. Irid. Healing normal.	$\frac{1}{10}$	Disc.	$\frac{1}{10}$	Iris injured in section.
21	Laureano Arce. 67 yrs. Good.	Mature. Durat. 2 yrs. R. E.	Simple extr. Healing normal.	$\frac{2}{10}$	Disc.	$\frac{1}{10}$	Still remnants in pupil after discision.
22	Antonio Poly. 24 yrs. Good.	Soft. Durat. 3 yrs. L. E.	Extr. w. Irid. 2d day large prol. of iris (traumatic). Excision. Slow closure of ant. ch.	$\frac{1}{10}$		$\frac{1}{10}$ (1 yr. later) Irid. adv.	Irid. on account of tendency to prolapse.
23	José Parrondo. 38 yrs. Good.	Mature. Durat. 4 yrs. L. E.	Extr. w. Irid. Dislocation of lens. Extr. w. wire loop. Mod. loss of vitr. Healing; moderate iritis.	$\frac{1}{10}$			Iris injured in section.
24	N. Acosta. 70 yrs. Ulcer of leg.	Mature. Durat. 3 yrs. L. E.	Extr. w. Irid. Mod. loss of vitr. Healing normal.	$\frac{1}{10}$	Estimated		Irid. to facil. extraction.
25	Manuel Fernandez. 50 yrs. Good.	Mature. R. E.	Extr. w. Irid. Extr. w. wire loop (no vitreous). Healing normal.	$\frac{1}{10}$			Irid. to facil. extraction.
26	Mariano Mondejar. 45 yrs. Good.	Mature. Durat. 4 yrs. R. E.	Simple extr. Healing normal.	$\frac{1}{10}$	Disc.	$\frac{1}{10}$	
27	Mariano Mondejar. 45 yrs. Good.	Mature. Durat. 4 yrs. R. E.	Simple extr. Mod. iritis.	$\frac{1}{10}$	Disc.	$\frac{1}{10}$	
28	Sebastian de la Torre. 21 yrs. Good. (Negro.)	Complic. Funct. exam. normal. R. E.	Simple extr. Healing normal.	V. = O.			Detachment of retina L. E. Equatorial staphyloma. Cataract. V = O.

No.	NAME—AGE—HEALTH.	CHARACTER OF CATARACT.	OPERATION—HEALING.	PRIM. V.	SECONDARY OPERATION.	ULT. V.	REMARKS.
29	Altargracia Garcia. 21 yrs Good. (Negress.)	Soft. Complic. traumatic. R. E.	Simple extr. Lens expelled spont.; loss of vitr. Healing: central prol. of iris (traumatic).	$\frac{15}{200}$	Excision of prolapse (6 wks. after extr.).	$\frac{15}{100}$	Pt. very unruly.
30	Domingo Arozarena. 70 yrs. Good.	Hypermat. Durat. 5 yrs. L. E.	Simple extr. Slow. clos. ant. ch.	$\frac{15}{60}$	2 Disc.	$\frac{15}{30}$	Later S. fell to $\frac{15}{40}$.
31	Pedro Alonso. 58 yrs. Good.	Mature. L. E.	Simple extr. Healing normal.	$\frac{15}{30}$	Disc.	$\frac{15}{30}$	
32	M. San Ignacio. 65 yrs. Good.	Mature. Durat. 3 yrs. R. E.	Simple extr. Healing normal.	$\frac{15}{30}$	Disc.	$\frac{15}{30}$	
33	Hypolite Hagermann. 65 yrs. Good.	Mature. R. E.	Extr. w. Irid. Healing normal.	$\frac{15}{30}$			Irid. to facil. extraction.
34	Pablo Perez. 73 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Simple extr. 2d day prolap. of iris (traum.). Abscession. Healing normal.	$\frac{6}{200}$			S. tested 3 wks. after extr. and pupil still filled w. remnants, probably improved.
35	Tomas Vallarin. 48 yrs. Good.	Morgagnian. Durat. 2 yrs. L. E.	Simple extr. Healing normal.	$\frac{15}{30}$ 1 yr. later: $\frac{12}{200}$	2 Disc.	$\frac{15}{40}$	
36	Agapita Perez. 62 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Extr. w. Irid. Spongy iritis.	$\frac{15}{200}$	Disc. Extr. (forceps) of capsule.	$\frac{15}{30}$	Irid. to facil. expulsion.
37	Gil Blas Yanez. 42 yrs. Good. (Negro.)	Mature. Durat. 7 yrs. L. E.	Simple extr. Healing normal.	$\frac{15}{30}$			
38	Evaristo Asen. 80 yrs. Good. (Chinaman.)	Mature. R. E.	Extr. w. Irid. Healing normal.	$\frac{20}{30}$ Estimated			Irid. to facil. expulsion.
39	Manuel Garcia. 55 yrs. Good.	Mature. Durat. 3 yrs. R. E.	Simple extr. Healing normal.	$\frac{15}{30}$ 7 m later: $\frac{15}{200}$	Disc.	$\frac{15}{30}$	
40	Luis Quintero. 56 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Simple extr. Healing normal.	$\frac{15}{100}$	Disc.	$\frac{15}{30}$	Media clear. Partial atrophy of O. N. temporal quadr. (toxic).
41	Antonio Ferrer. 70 yrs. Good.	Mature. Durat. 6 yrs. L. E.	Simple extr. Healing normal.	$\frac{15}{30}$		$\frac{15}{40}$ 2 yrs. later	
42	Joaquin Menendez. 68 yrs. Good.	Mature. Durat. 1½ yrs. R. E.	Simple extr. Laborious. Slow closure of ant. ch. Severe iritis.	$\frac{15}{30}$ Later: $\frac{15}{100}$	2 Disc.	$\frac{15}{200}$	1 yr. after extr. severe iritis. Recovery. V. $\frac{15}{30}$. L. E. lost, plastic cyclitis after extr. by brother oculist.

43	Francisco Berges. 70 yrs. Good.	Mature. R. E.	Extr. w. Irid. ch. Slow closure of ant.	$\frac{2}{30}$	2 Disc.	$\frac{2}{30}$	Slight improvement in S. due to dense sec. capsule. Iridotomy adv. Irid. to facil. extraction.
44	Pedro Bernal. 79 yrs. Good.	Mature. R. E.	Simple extr. Slow closure of ant. ch.	$\frac{1}{15}$	Disc.	$\frac{1}{15}$	
45	José García Acabal. 55 yrs. Good.	Mature. L. E.	Simple extr. 2d day large prol. of iris. Excls. Spongy iritis.	$\frac{1}{15}$	Disc.	$\frac{1}{15}$	
46	Tomas Corona. 55 yrs. Good.	Mature. Chronic trachoma. Corn. opacities. Durat. 2 yrs. L. E.	Extr. w. Irid. Extr. w. wire loop. Loss of vitr. Healing: purulent iritis. Plastic cyclitis.	V. = O.			Irid. to facil. extraction.
47	M. San Bernardino. 60 yrs. Good.	Mature. L. E.	Simple extr. Healing normal.	$\frac{1}{30}$			
48	Ana Rosain. 72 yrs. Feeble, sickly.	Complicated? Durat. 3 yrs. L. E.	Extr. w. Irid. Extr. of part of nucleus w. wire loop. Remainder dislocated upwards. Loss of vitr. Plastic iritis, closure of pupil.	P. of L.	Iridectomy.	$\frac{6}{30}$	Irid. to facil. expulsion. Light during operation very poor. Immed. after irid. obtained better S. but opening closed by plastic exudate. R. E. operated by brother oculist sev. yrs. before. Cataract left in eye. (Subluxation.) Phthisis bulbi.
49	Sixto Rodriguez. 59 yrs. Good. (Negro.)	Complic. L. E.	Extr. w. Irid. Lens dislocated upwards. Extr. in capsule. Healing normal.	$\frac{2}{40}$			Irid. to facil. expulsion. Keratoglobus. Cornea very thin, crumpled like paper immed. after section.
50	Sixto Rodriguez. 59 yrs. Good. (Negro.)	Complic. Durat. $1\frac{1}{2}$ yrs. R. E.	Simple extr. Healing normal.	$\frac{2}{40}$			Kerato-globus. Cornea very thin, crumpled like paper immed. after section.
51	Francisco Porras. 45 yrs. Good.	Complic. traumatic. R. E.	Extr. after prelim. Irid. Loss of vitr. Partial collapse of globe. Extr. w. wire loop. Healing normal.	$\frac{1}{30}$	Disc.	$\frac{4}{30}$	L. E. Detachment of retina.
52	Mannel Panades. 52 yrs. Good.	Mature. L. E.	Extr. w. Irid.; w. wire loop. Loss of vitr. Healing: plastic iritis, closure of pupil.	V. = Mov. of Hds.	2 Iridectomies. I Iridotomy.	V. = Mov. of Hds.	Irid. to facil. extr. Openings in iris of sec. operation immed. closed by plastic exudate.
53	Francisco Hernandez. 75 yrs. Good. (Negress.)	Mature. R. E.	Simple extr. Healing normal.	$\frac{2}{40}$			
54	Merced Gonzalez. 60 yrs. Good. (Muttatto.)	Mature. L. E.	Extr. w. Irid. Iridodialysis. Healing: ang. incarceration.	$\frac{1}{15}$			Irid. on account of tendency to pro-lapse.

No.	NAME—AGE—HEALTH.	CHARACTER OF CATARACT.	OPERATION—HEALING.	PRIM. V.	SECONDARY OPERATION.	ULT. V.	REMARKS.
55	José Lopez. 53 yrs. Good.	Morgagnian. Durat. 3 yrs. R. E.	Simple extr. Slow closure of wound.	$\frac{1}{8}$			
56	Francisco Hernandez. 75 yrs. Good. (Negress.)	Mature. Durat. 2 yrs. L. E.	Extr. w. Irid. Healing normal.	$\frac{1}{8}$ Estimated			Irid. to facil. expulsion.
57	Nazario el Tuerto. 35 yrs. Good.	Complic. traumatic. Durat. 20 yrs. L. E.	Extr. w. Irid. Loss of vitr. Extr. w. wire loop. Healing normal.	$\frac{3}{8}$ Sec. Cat. Disc. Adv. vided.			Irid. to facil. extraction.
58	M. Natividad. 70 yrs. Good.	Mature. Durat. 7 yrs. R. E.	Simple extr. Healing normal.	$\frac{1}{8}$			
59	Luis Quintero. 57 yrs. Good.	Mature. Durat. 2 yrs. R. E.	Simple extr. Healing normal.	$\frac{1}{8}$ $\frac{2}{8}$	Disc.	$\frac{1}{8}$	Media clear. Partial atrophy of O. N. toxic.
60	Edita Martinez. 25 yrs. Anæmic.	Soft. Complicated. Durat. $1\frac{1}{2}$ yrs. L. E.	Simple extr. Healing normal.	$\frac{2}{8}$			Atrophic choroiditis.
61	Manuel A. de la Fuente. 70 yrs. Good.	Mature. L. E.	Simple extr. Healing normal.	$\frac{1}{8}$ $\frac{2}{8}$			
62	Carlota Nunez. 63 yrs. Good.	Mature. Durat. 4 yrs. L. E.	Simple extr. 2d day central prolapse. Excision. Healing normal.	$\frac{1}{8}$			
63	Carlota Nunez. 63 yrs. Good.	Mature. Durat. 3 yrs. R. E.	Extr. w. Irid. Extr. w. wire loop (no vitreous). Healing normal.	$\frac{1}{8}$			Irid. to facil. extraction.
64	Dolores Valdes. 80 yrs. Good. (Negress.)	Mature. R. E.	Extr. w. Irid. Collapse of cornea. Extr. w. wire loop (no vitreous). Healing normal.	$\frac{1}{8}$ Estimated			Irid. to facil. extraction. Excessive hypotony.
65	Martina Trujillo. 74 yrs. Good.	Hypermaturation. Durat. 10 yrs. L. E.	Simple extr. Healing normal.	$\frac{3}{8}$			
66	Dolores Valdes. 80 yrs. Good. (Negress.)	Mature. L. E.	Extr. w. Irid. Collapse of cornea. Extr. w. wire loop (no vitr.). Healing : infection of wd. Cauterized w. red-hot probe. Partial supp. of cornea. Closure of pupil.	V. = Mov. of Hds.			Irid. to facil. extraction. Excessive hypotony. Would possibly benefit by iridotomy.
67	Fernando de Herrera. 56 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Simple extr. Slow closure of ant. ch.	$\frac{1}{8}$ Sec. Cat. Disc. Adv.			
68	Julian Delgado. 50 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Simple extr. Healing normal.	$\frac{1}{8}$			
69	Francisco Ramos Almeyda. 83 yrs. Urine = alb.	Mature. Durat. 4 yrs. L. E.	Extr. w. Irid. Extr. w. wire loop (no vitr.).	$\frac{1}{8}$	Disc.	$\frac{1}{8}$	Irid. to facil. extraction.

70	Manuel Fernandez. 51 yrs. Good.	Mature. L. E.	Durat. 3 yrs.	Simple extr. normal.	Loss of vitr. Healing normal.	$\frac{1}{6}$				
71	Rafael Garcia. 60 yrs. Good.	Mature. R. E.	Durat. 2 yrs.	Simple extr.	Healing normal.	$\frac{5}{30}$				
72	Juana Moran. 70 yrs. Good.	Complic. R. E.	Durat. 2 yrs.	Extr. w. Irid. w. wire loop.	Loss of vitr. Extr. Healing normal.	$\frac{15}{200}$				Corneal opacities, old iritic adhesions. Irid. to facil. extraction.
73	Rafael Garcia. 60 yrs. Good.	Mature. L. E.	Durat. $1\frac{1}{2}$ yrs.	Simple extr.	Healing normal.	$\frac{2}{40}$				
74	Manuel Serrano. 59 yrs. Good.	Almost mature. 1 yr. R. E.	Durat. R. E.	Simple extr.	Healing normal.	$\frac{15}{30}$ Later: $\frac{4}{6}$	Disc.	$\frac{1}{40}$		
75	Tomas Vallarin. 45 yrs. Good.	Mature. L. E.	Durat. 2 yrs.	Simple extr.	Slow clos. ant. ch.	$\frac{15}{30}$	Disc.	$\frac{15}{30}$		
76	H. Bosselmann. 58 yrs. Good.	Complic. (myopia). Durat. 3 yrs. R. E.	Durat. R. E.	Extr. w. Irid. Loss of vitr.	Extr. w. wire loop. Healing: mod. iritis.	$\frac{15}{30}$	Disc.	$\frac{15}{30}$		Irid. to facil. extr. 1 yr. after extr. severe iritis. V. reduced to $\frac{8}{30}$. Recovery w. V. = $\frac{15}{30}$ +.
77	Merced Gonzalez. 60 yrs. Good. (M-latto.)	Morgagnian. R. E.		Simple extr.	5th day sm. central prolapse (traumatic).	$\frac{15}{30}$				
78	José Ramon Gonzalez. 59 yrs. Good.	Almost mature. 1 yr. R. E.	Durat. R. E.	Extr. w. Irid. Slight loss of vitr.	Extr. w. wire loop. Healing normal.	$\frac{15}{300}$	Disc.	$\frac{20}{30}$		Irid. to facil. extraction.
79	N. Portocarrero. 70 yrs. Good.	Mature. L. E.	Durat. 4 yrs.	Simple extr.	Loss of vitr. Extr. w. wire loop. 6 hrs. after extr. severe choroidal hge. No. infl., no supp. Phthisis bulbi.	V. = O.				R. E. operated by brother oculist, several years before, also lost by intraoc. hge.
80	José Maria Suarez. 23 yrs. Good.	Complic. traumatic. P. of L. in upper V. F. obscure. 1 yr. R. E.	Durat. R. E.	Extr. w. Irid. (no vitr.).	Extr. w. wire loop. Healing normal.	V. = P. of L. Remnants in pupil.				2 previous disc. Irid. to facil. extraction.
81	Mariana Barrero. 61 yrs. Good.	Mature. R. E.	Durat. 2 yrs.	Extr. w. Irid. (no vitr.).	Extr. w. wire loop. Healing: iritis.	$\frac{15}{30}$				
82	Nicolas Matoran. 54 yrs. Heart disease. Urine=alb.	Mature. R. E.	Durat. $3\frac{1}{2}$ yrs.	Simple extr.	Healing normal.	Estimated				Pt. died of ht. disease 4 wks. after extr., before testings. Wd. healed. Useful S.
83	Antonio de la Piedra. Urine=alb.	Mature. L. E.	Durat. 3 yrs.	Extr. w. Irid. at extr., luxated lens upwards. Loss of vitr. Plastic iritis, 14 days after, extr. w. wire loop (easy). Corneal necrosis, panophthalmitis, phthisis bulbi.	1st ineffect. attempt. Plastic iritis, 14 days after, extr. w. wire loop (easy). Corneal necrosis, panophthalmitis, phthisis bulbi.	V. = O.				During the 1st. operation very poor light. Irid. to facil. extraction.

No.	NAME—AGE—HEALTH.	CHARACTER OF CATARACT.	OPERATION—HEALING.	PRIM. V.	SECONDARY OPERATION.	ULT. V.	REMARKS.
84	Manuel Garcia. 51 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Simple extr. 2d day prolapse of iris. Excision. Healing normal.	$\frac{7}{60}$	Disc.	$\frac{15}{60}$ Estimated	
85	Justo Gonzalez. 25 yrs. Good. (Negro.)	Complicated traumatic. Durat. 4 mos. R. E.	Extr. w. Irid. Healing normal.	$\frac{6}{200}$	Disc.	$\frac{20}{200}$	Irid. due to tendency to prolapse.
86	Tomasa Iduarte. 80 yrs. Good. (Negress.)	Mature. R. E.	Simple extr. Healing normal.	$\frac{4}{6}$			
87	Andres Vento. 60 yrs. Good.	Mature. Durat. 3 yrs. L. E.	Extr. w. Irid. Loss of vitr. Extr. w. wire loop. Healing; incarc. of iris.	$\frac{15}{70}$			Irid. to facil. extraction.
88	Tomasa Iduarte. 80 yrs. Good. (Negress.)	Mature. L. E.	Simple extr. Healing normal.	$\frac{6}{60}$ Disc. adv.			
89	Serapio Martin. 51 yrs. Good.	Mature. Durat. 2 yrs. L. E.	Simple extr. Healing normal.	$\frac{4}{40}$			
90	Martin G. Setuein. 65 yrs. Good.	Morgagnian. Durat. 4 years. R. E.	Simple extr. Healing normal.	$\frac{1}{6}$ Estimated			
91	M. Sta. Gertrudis. 83 yrs. Good.	Mature. Durat. 5 yrs. R. E.	Extr. w. Irid. Incarc. of iris.	$\frac{15}{200}$	Disc.	$\frac{15}{200}$	Irid. on account of tendency to pro- lapse.
92	Martinez Valdivieso. Good.	Mature. Durat. 5 yrs. L. E.	Simple extr. Healing normal.	$\frac{3}{6}$			
93	Pedro Almuedo. 68 yrs. Good.	Mature. Durat. 4 yrs. R. E.	Simple extr. Slow clos. ant. ch.	$\frac{1}{40}$			
94	Maria Dominguez. 63 yrs. Good.	Complicated. R. E.	Extr. w. Irid. Extr. w. wire loop (no vitr.).	$\frac{1}{6}$ Estimated			Irid. to facil. extraction.
95	Nieve Rodriguez. 51 yrs. Good.	Morgagnian. Durat. 4 yrs. R. E.	Simple extr. Healing normal.	$\frac{1}{6}$	Disc.	$\frac{15}{30}$	
96	Mauricio Rosell. 73 yrs. Good. (Negro.)	Complicated. L. E.	Simple extr. 2d day prolapse. Excis. Healing; iritis, closure of pupil.	V. = Mov. of Hds.	Disc.	$\frac{4}{60}$	Media clear. Nerve cupped? R. E. cataract glaucoma. V. = O.
97	Edwigis Gonzalez. 68 yrs. Good.	Mature. R. E.	Simple extr. Healing normal.	$\frac{2}{60}$			
98	Caridad Garriga. 58 yrs. Good.	Mature. Durat. 2 yrs. R. E.	Simple extr. 2d day prolapse. Excis. Healing normal.	$\frac{1}{60}$			
99	Ignacio Lopez. 59 yrs. Good.	Complic. Glaucoma. Proj. poor. Durat. 7 yrs. R. E.	Extr. w. Irid. Loss of vitr. Pro- fuse hge. Healing normal.	V. = O.			Irid. to facil. extraction.
100	Antonio Ruiz. 58 yrs. Good.	Mature. R. E.	Simple extr. Healing normal.	$\frac{2}{60}$			

A CASE OF ANGIOMA ORBITÆ FIBROSUM.

BY DR. ERNST NEESE, KIEW.

(*With three figures on Plate II. of Vol. XXXV., Germ. Edition.*)

Translated by Dr. WARD A. HOLDEN.

Nov. 20, 1896, I received into the hospital a farmer of twenty-four, who was apparently healthy. His right eye was pressed forward out of the orbit by a globular tumor as large as a small apple, on the anterior surface of which the eye rested. The cornea, anterior chamber, and pupil were of normal appearance, the media were clear, and the optic disc presented the ophthalmoscopic picture of atrophy of the nerve, which explained the complete blindness. The axis of the protruding eye was turned toward the nose, the tumor having presented more to the outer side. The active mobility of the eye was abolished. The tumor filled the entire orbit, touching the orbital margin on every side, and its anterior pole protruded about one centimetre. The upper lid which partially covered the tumor was greatly stretched and showed a considerable development of vessels. The surface of the tumor was flattened and somewhat nodular. In consistency it was elastic but too hard to be compressible. Neither pulsation nor alteration of volume could be detected, and the tumor could be but slightly moved up and down and to the right and left.

The growth had developed, without any known cause, very gradually for several years. There has never been any pain, and except for the deformity the patient suffered no inconvenience.

A clinical diagnosis was made of fibroma of the orbit within the muscle funnel, behind and external to the eyeball, and removal was advised, to which the patient readily consented. Under the circumstances there was no possible chance of saving the eyeball.

Dec. 4th.—The operation was done under chloroform with the

assistance of Dr. Botscharoff, of the surgical clinic. After elevating the upper lid with hooks, the mucous membrane along the retrotarsal fold and the orbital margin was divided first above and then below. Then with the fingers and the blunt points of the scissors the tumor was separated from the orbital wall to which it was not tightly adherent. Finally the optic nerve was divided and the tumor shelled out without much difficulty, from which fact one could conclude that it had developed exclusively in the cellular tissues. The orbit filled with granulation tissue and the course of healing was uncomplicated. The further history of the patient is unknown to me.

The spherical tumor with the ball was put into Müller's fluid and examined a year after. When divided in half, the tumor measured 5-6 *cm* in antero-posterior diameter, and 4-5 *cm* in its shortest diameter, from side to side (Fig. 1, Plate II.). It lay to the outer side of the ball and optic nerve, flattening the former. The entire tumor is surrounded by a capsule, and this explains the ease with which it was separated from the walls of the orbit. In sections, the structure of the tumor appears sponge-like or cavernous, the cavities being larger and closer together in the centre of the tumor. In places the cavities are only of pin-head size so that the tissue has a porous appearance. At present the cavities are empty. At some points to the naked eye the tumor appears to be a compact mass.

Microscopic examination of the growth showed a stroma of fibrous or fibrillar tissue, with many elongated nuclei, in which were vessels of different sizes. In some sections (Fig. 2, Pl. II.) these vessels appear as great distended cavities with traces of an endothelial lining (Fig. 2, *e*). Some of the cavities contain blood corpuscles, so there is no question as to their nature. The predominance of fibrous stroma over vessels (Fig. 3), which was indicated by the hardness of the tumor, justifies us in calling the growth a fibrous variety of angioma.

The angiomatous neoplasms of the orbit first attracted the attention of Travers and of Dalrymple. Later the number of observations increased, and with this skepticism arose as to whether the authors were really dealing with true cavernous tumors and not perhaps with ordinary aneurisms, since the reports were mostly of a clinical nature exclusively and but rarely supported by careful pathological

examinations, and since the deep location of the tumor in the orbit made an absolute clinical diagnosis difficult.

Nunneley and Hulke, therefore, in 1859, went so far as to deny the existence of orbital angioma altogether, and to attribute the exophthalmus, pulsation, and bruit to aneurism within the cranial cavity, carcinoma and thrombosis of the cavernous sinus, and the like, supporting their views by original observations.

Virchow did not question the occurrence of true orbital angioma, and he described, among other cases, one in which a congenital tumor was removed by Dieffenbach from beneath the upper lid of a man of twenty-four and examined microscopically by Lebert.

Still the first case of cavernous angioma of the orbit to be examined carefully, both clinically and pathologically, was described by von Graefe, and mentioned particularly by Virchow, in *Die krankhaften Geschwülste* (p. 331, fig. 232). The patient was a man of fifty-five, otherwise healthy, who had noticed for eight years the gradual painless development of an elastic compressible tumor deep in the orbit within the muscle funnel, which at first, from time to time, caused exophthalmus with strangulation of the ball, and later caused protrusion of the ball almost daily. Von Graefe remarked that with a tumor of this sort its spontaneous swelling and shrinking was of great diagnostic importance, since the same symptoms could be produced artificially by checking the circulation mechanically. Graefe called attention, further, to the tense elastic, but never hard, consistency, the almost completely preserved play of the ocular muscles, the location in the fatty tissue of the orbit, the very slow growth, the painlessness, and, finally, the good general condition of the patient; and he asks which of these signs will in the future be found to be characteristic of cavernous tumors of the orbit, and which not.

After this classic description by von Graefe we should mention the cases of de Wecker, Maury, and Horner, which were carefully examined both clinically and pathologically. In de Wecker's case the growth was due to an injury received from a shuttle fourteen years before. The ball, which

protruded about one centimetre, was almost motionless. The tumor was removed with preservation of the ball, but not much mobility was obtained. The microscopic examination was made by Cornil.

In Maury's case the exophthalmus had begun fifteen years before, and the equator of the ball now lay anterior to the margin of the orbit. The mobility of the ball was somewhat restricted, particularly outward. There was never observed any change in the volume of the tumor, which had developed at the outer wall of the orbit, and had penetrated the muscle funnel between the external and inferior recti. The microscopic examination was made by Maier.

In Horner's case the tumor developed gradually behind a blind and squinting eye. Here the mobility was entirely preserved, and pressure on the tumor caused an alteration in size. The tumor lay within the muscle funnel, and consisted of two parts. The microscopic examination was made by Eberth.

Less accurately described, about the same time, was a case by Holmes. Here there were pronounced exophthalmus, almost complete loss of mobility, and displacement of the ball downward and inward. The tumor was quite hard, and had developed in eighteen months to such a degree that it filled the entire outer half of the orbit. The tumor was extirpated with preservation of the eye. The anatomical examination showed small cavities filled with blood and separated by very thin walls, the structure resembling that of the corpus cavernosum.

Knapp's case in an infant ten weeks old, in which the anterior portion of the tumor showed alterations in volume, is of interest to us because the posterior portion of the tumor showed, as in our case, the structure of a fibrous angioma. In a later case (1896) reported by Knapp, the tumor lay within the muscle funnel at the apex of the orbit, whence it was removed with preservation of the ball. The ball was slightly displaced inward and downward, the mobility was almost normal, and changes of volume in the tumor could not be made out.

A palpable swelling of the tumor, which had developed

for fourteen years within the muscle funnel of a patient of seventy-six, was observed in Mauthner's case. Here also the growth was removed with preservation of the ball. In this case all the symptoms found by von Graefe were present except lack of pain, but the pain was slight and not constant.

Another case reported by Ahrens is interesting, because the tumor, which had developed during four years, lay entirely outside the muscle funnel between the ball and the inner-lower margin of the orbit. There was no exophthalmus, but all the rest of von Graefe's symptoms were present. The enucleation and the pathological examination were made by Zehender.

A case reported by Gosetti was less satisfactory from a pathological view-point, although the clinical report was good. Here a hard, elastic, and but slightly compressible tumor, that did not swell up and was not painful, developed in the depth of the orbit of a man of sixty, in the course of seven years. The mobility of the ball was slightly restricted outward and inward. The extirpation of the tumor was done with preservation of the ball. The tumor was surrounded by a dense fibrous capsule, and was called by Paganuzzi an "angioma simplex."

More detailed in its pathological but briefer in its clinical aspect was the report of von Brincken. His patient was two years and a half old, and enucleation of the ball was necessary. The microscopic report of the fan-like, cavernous tumor with endothelial membranes was made by Professor Neelsen.

Rather original was the case reported by Peyrot. In a girl of twenty-three there had developed during six or seven years a tumor of the orbit so extensive that nothing could be seen of the eye. The tumor was removed entire, and after tedious suppuration and an erysipelas there was recovery. Poncet examined the tumor microscopically, could find no trace of eyeball, and designated the tumor as a cavernous melanotic fibroma. This diagnosis was questioned by Berlin, because the complete destruction of the ball suggested rather a tumor which had originated in the eyeball itself. Several months later the patient came to

Panas, with pain in the operated orbit and beginning sympathetic ophthalmia. It now appeared that the phthisical and painful eyeball remained in the depth of the orbit. After removal of the ball, the sympathetic disturbance passed off, and Berlin no longer questioned the original diagnosis.

Forty other cases have been reported, some in less detail, others imperfectly, and others again in which the diagnosis was questionable. The authors' names and references are given in the bibliography at the end of the paper.

Among the cases cited, the vascular tumors of the orbit may be divided into the simple and the cavernous angiomas. Tumors of the first sort are easily recognized, since they stand in more or less apparent connection with dilated vessels on the surface of the lids or neighboring parts. The only exception would be the case of Gosetti, in which what was called an "angioma simplex" was found in the depth of the orbit without any connection with the surface. Such a location, more or less deep in the orbital cellular tissue, and independence of superficial vascular trunks, are characteristic of the cavernous variety of angioma.

Taking into consideration these cases, and chiefly the first case of von Graefe's, Berlin attempted to sketch the clinical picture of cavernous angioma of the orbit.

One of the important signs is its *painlessness*, in which it differs markedly from all malignant tumors of the orbit. In Horner's case alone was pain complained of, and this had appeared only in the last two years, while the tumor had existed without causing pain for fourteen years. In Mauthner's case also there was moderate pain, but only at intervals.

A second sign is the exceeding *slowness of growth*. Thus in Ahrens's case the tumor had developed for four years; in the case of Peyrot and in that of Gosetti from six to seven years; in von Graefe's case eleven years; in Knapp's case twelve years; in the case of Mauthner and in that of de Wecker fourteen years; in Manz's case fifteen years; in Horner's case sixteen years; and in Ricci's case even nineteen years.

The *mobility of the eye* and the free play of the muscle are practically preserved in all cases, and in only a few is there diminished mobility in a particular direction corresponding to the location of the tumor, and in de Wecker's case alone was there almost complete immobility.

Another sign is the *elastic consistency* of the tumor, although its actual hardness varies. Thus in von Graefe's case it was tense but not hard; in Ahrens's case tense and elastic like the corpus cavernosum; in the case of de Wecker and in that of Horner soft; in one of Knapp's cases resistant but soft, and in the other case rather hard; in Mauthner's case soft but at times harder. Only in Gosetti's case, in which he called the tumor a simple angioma, was it "consistent" but elastic; while in Story's case, in which the tumor proved to contain a phlebolith, it was as hard as stone.

Another sign is the *compressibility* of the tumor. This was especially noted in Horner's, Knapp's, Samelsohn's, and Gussenbauer's cases.

The most characteristic peculiarity of cavernous angioma, however, is its *tendency to swell* under the influence of venous stasis. This symptom was noted by von Graefe, Horner, Knapp, Mauthner, Samelsohn, Story, and others.

A less constant symptom is the mobility of the growth. In Horner's, Samelsohn's, and Ahrens's cases this was noticed, while in Knapp's first case, on the contrary, the growth was adherent to the wall of the orbit.

Finally, *good general health* has existed in every case.

If we now return to our own case, it will be seen that in spite of its angiomatous character it lacked many of the characteristic symptoms, and clinically differed considerably from both the simple and the cavernous angiomas.

Thus though elastic it was almost as hard as cartilage and it was almost incompressible. Such hardness is not found in angiomatous tumors as a rule. There was no swelling from venous stasis, as is common; but this was explained by the predominance of fibrous tissue in the tumor. The fibrous variety of angioma is very rare, since Knapp's case alone of the many reported had the structure of fibrous angioma, and this only in one part of the growth. It is possible that

Gosetti's case, though called simple angioma, would properly belong in this category.

Of the other usual symptoms that were lacking were the free play of the muscles and the unrestricted mobility of the ball. This also can be explained by the hardness of the tumor, which doubtless stretched the extrinsic muscles and brought about their atrophy. There was only a certain degree of passive mobility remaining to the tumor, which was enclosed in a capsule and hence loosely attached to the orbital walls.

Thus in our case there remain of the characteristic symptoms only the painlessness, the slow growth, and the good general health.

In its clinical aspects our tumor resembled in some degree a particular variety of angioma—cavernous lymphangioma of the orbit. This is an extremely rare form of orbital tumor and Berlin doubted its existence. There have been but three cases reported, one by Forster, one by Wiesner, and one by Ayres.¹ In Wiesner's case, at least, the consistency of the tumor was hard and there was no transitory swelling. The play of the muscles was greatly restricted in all directions in Forster's case, the tumor lying within the muscle funnel; it was restricted downward in Wiesner's case, the tumor lying between the periosteum and the muscle funnel. Painlessness, slow growth, and good general health existed in all three.

The hardness of our tumor, with the clinical signs of benignity, led us to make a clinical diagnosis of fibroma. This was done in many of the other cases reported. The differential points would be the slower growth of angioma and its almost exclusive location within the muscle funnel.

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Explanation of the Figures.

Fig. 1. Horizontal section through the tumor and the right eyeball. Natural size. *T*, tumor; *A*, lower segment of the ball; *N*, optic nerve.

Fig. 2. Microscopic section of the tumor. Hematoxylin stain. Zeiss obj. a., oc. 3. *e*, endothelial layer.

Fig. 3. Microscopic section of another part of the tumor. Hematoxylin stain. Zeiss obj. a., oc. 3.

ON FIBROMA OF THE CORNEAL LIMBUS IN SPRING CATARRH.¹

BY DR. HANS SCHLUB.

(*With five figures on Plates IV.-V. of Vol. XXXV., German Edition.*)

Abridged Translation by Dr. WARD A. HOLDEN.

INTRODUCTION.

SPRING catarrh of the conjunctiva is not common, and only in the last twenty-five years has it been recognized and described as a distinct disease. Nevertheless there are to be found in literature a great number of papers on the subject. It is described as an affection of the palpebral conjunctiva and of the limbus of the conjunctiva, which affects particularly males in the first two decades of life, recurs year after year in the warm season, is not improved by treatment, and finally passes off permanently without leaving scars.

Sæmisch christened the disease spring catarrh, and this name appeared first in a dissertation by Brockhaus, a pupil of Sæmisch's. Before this, what was probably the same disease had been mentioned under other names, with the consideration of other symptoms, by Arlt, von Graefe, Desmarres, and de Wecker. More than a dozen names have been suggested since, without finding general acceptance. While the earlier descriptions were of the changes at the limbus only, the later clinical histories included also accounts of the growths on the palpebral conjunctiva, and one observer finds the thickening at the limbus — most pronounced

¹ From the laboratory of the University Eye Clinic of Professor Mellinger at Basle.

in the exposed zone — more constant, and another attaches more importance to the fungus-shaped cobble-stone-like excrescences of the conjunctiva of the upper lid. In all descriptions since this dissertation appeared, weight is laid on the fact that the disease recurs with the beginning of warm weather and passes off as the cooler season approaches.

The descriptions of the microscopic changes found in bits excised from the lid or the limbus are much more uniform than those of the clinical picture, and I wish to give a brief résumé of the reports of Camuset, Reymond, Vetsch, Horner, Uhthoff, Knus, Tailor, Schoebl, Haab, Raabe, and Burckhardt. The new growths have always been described as consisting of epithelium and connective tissue. A marked increase in the epithelial layer, which particularly at the limbus gives the new formation the character of an epithelial neoplasm, has been reported by most of the authors mentioned. The layer has been found to be so thickened that it was thirty strata of cells deep, and besides this epithelial processes have been found dipping down into the stroma and giving rise to a picture suggesting epithelioma. According to these authors, the stroma is not much increased, and at least in the new growths at the limbus plays a subordinate rôle.

Views differing from these have been expressed only by Reymond, whose specimens were imperfect, and by Burckhardt, who found that in a case observed in the Basle clinic the connective tissue was far greater in amount than the epithelium. I am now able to add the report of two similar cases from the same clinic, and for the sake of comparison Burckhardt's report is here repeated.

THREE CASES OF PRONOUNCED PROLIFERATION OF CONNECTIVE TISSUE AT THE LIMBUS IN SPRING CATARRH.

CASE 1.—H. R., aged twelve, has suffered for the past two years with an inflammation of the eyes, appearing in the spring and passing off with the approach of cold weather. Lately growths have been noticed on both eyes, and the boy was brought to the clinic, presenting the following condition: R, conjunctiva of lids slightly catarrhal, but having a whitish cast, and in the upper lid there are some follicles. At the temporal margin of

the cornea is a dense elevation, as large as a small bean, with a gray, uneven surface. In the left eye smaller tumors were situated one at the nasal and one at the temporal margin of the cornea. The tumors were removed and the wounds scraped. Uneventful healing.

The bits of tissue removed, like those in the following cases, were hardened in Müller's fluid and cut in paraffin.

The tumor from the left eye was 5 *mm* long and at one end 1.5 *mm* thick, while at the other end it became thinner (Fig. 1, Plate IV.).

Slightly magnified, one saw a thick epithelial layer, with darkly stained nuclei, forming the surface of the tumor, while the bulk of the tumor, at first glance, seemed to consist of an accumulation of round cells. When carefully examined the following details could be made out. At the narrow end of the section the round cells lie close together beneath the epithelium, but lower down these are present in smaller number and take on a network-like arrangement, while the fibres of the ground substance have a wavy course. At the broad end the infiltration is more considerable. The cells lie in close groups separated by paler zones. These paler interstices consist of branching fibres—the broad trunk at the base of the tumor breaking up into small branches, which extend out to the epithelium. Between the branched tracts of fibres lie the groups of round cells mentioned above, more closely in the central portion of the tumor.

The epithelial covering plays a subordinate rôle in our preparations. Near the free surface the epithelium is laminated and has few nuclei. In the layers next beneath, the regularly arranged nuclei form a fine mosaic, while in the deepest layer the nuclei lie close together with their long axes perpendicular to the margin of the epithelium. At the margin of the tumor the epithelium is thinner and the various layers are less regularly arranged.

The subepithelial zone (Fig. 2) is composed of a fine-fibred, reticular stroma, in the meshes of which lie round cells of various sizes. In the middle zones these round cells are so thick that they almost conceal the ground substance. Only a few dense tracts of fibres, rich in spindle cells, are seen extending from the broader fibrous masses at the base of the tumor in a radiating direction toward the surface. In the flatter portion of the tumor the number of cells is less. Vessels are present only in small number.

CASE 2.—T. S., aged sixteen, noticed redness and burning of

the eyes each summer for the past four years. Last year and the year before he had no trouble, but the affection returned last June, and triangular tumors appeared on each side of the cornea. The catarrhal symptoms passed off when the weather became cooler, but the nodules at the limbus remained, and were cut off. One tumor was $3 \times 1 \text{ mm}$ and the other $4 \times 1.5 \text{ mm}$. The greatest thickness was at the end next the cornea. In the smaller tumor (Fig. 3) the epithelium is very thin over the apex of the growth, and the superficial nuclei are arranged irregularly. The inferior line of limitation is broken and epithelial processes dip down into the stroma. The stroma makes up the bulk of the tumor. It is very rich in round cells, which have a distinct reticular arrangement in some parts. The stroma consists throughout of broad fibres which curve and leave many clefts among them. The cells filling these spaces are in part darkly stained small round cells, and in part large oval cells with a lighter protoplasm and paler granules. Finally, spindle cells are seen lying among the fibres. Many small vessels are present, but there is no round-celled infiltration about them. In Fig. 4 is shown, more highly magnified, epithelial processes dipping down into the stroma.

CASE 3.—P. R., aged twenty-four, has suffered every summer since his eighth year with redness of the eyes and lachrymation. Seven-years ago a membrane formed on the right eye and later two on the left.

The conjunctiva of the left eye is in a state of catarrhal inflammation and the papillæ of the palpebral conjunctiva are enlarged. At the temporal margin of the cornea and overlapping it $2\text{--}3 \text{ mm}$ is a flat, smooth, grayish tumor $6\text{--}8 \text{ mm}$ in length, 3 mm in breadth, and 1 mm thick. At the nasal margin is a similar smaller tumor. Both tumors were dissected off.

The larger tumor examined microscopically was found to have an epithelial layer four or five cells deep, the cells being mostly spindle shaped, and lying horizontal. They are not sharply outlined from the underlying tissue. The stroma is composed of wavy fibres running parallel, with many cells in the interstices. The cells in most places are small round cells or larger oval cells with a few spindle cells among them. In other parts of the sections the subepithelial layer contains exclusively spindle cells and the underlying stratum is richer in round cells. In Fig. 5 is shown such a portion of the tumor. At the base of the tumor is a loose connective tissue belonging to the conjunctiva.

In these three cases of spring catarrh the growths at the limbus were composed of connective tissue covered with a relatively thin layer of epithelium.

All the patients were males, their ages were twelve, sixteen, and twenty-four years, and the clinical histories were characteristic. In the twelve-year-old boy the affection had lasted for two years, the sixteen-year-old boy had noticed redness of his eyes in the summer for four years, and the third patient had suffered every summer for sixteen years.

The characteristic changes in all three patients were limited to the limbus, for while the palpebral conjunctiva showed symptoms of simple catarrhal or papillary inflammation, in no case were there the fungus-shaped or cobble-stone-like elevations in the retrotarsal fold or on the tarsal conjunctiva of the upper lid. The earlier writers mostly spoke only of the changes of the limbus in this disease, and Emmert found the disease limited to the limbus in eight out of twenty-nine patients with spring catarrh, and Knus in fifteen out of fifty-two.

The tumors, which were thickest next the cornea, were covered with epithelium and the stroma consisted of fibrous tissue with spindle cells, among which lay leucocytes and formative cells, the younger growths being more cellular and the older more fibrous. The designation fibroma, therefore, is fitting.

My thanks are due to Professor Mellinger for suggesting this study and for friendly advice during its progress.

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ON TWIN GANGLION CELLS IN THE HUMAN RETINA.¹

BY PROF. R. GREEFF, BERLIN.

Abridged Translation by Dr. WARD A. HOLDEN.

(*With three figures on Plate VI. of Vol. XXXV., German Edition.*)

ACCORDING to the later investigations, the retina is to be regarded as a true nervous centre shifted to the periphery. And the optic nerve is, properly speaking, no nerve, but a portion of the cerebral white matter which has been pushed forward. The retina is distinguished from the other nervous centres by its regular structure and the sharp separation of its various layers, to which attention has already frequently been called.

Thus it has happened that in recent years a great number of the articles in the anatomical journals have been devoted to the finer structure of the retina, problems of general interest regarding the finer composition of the nervous system being worked out by investigations on this membrane.

The retina has another extraordinary quality to which insufficient attention has been paid, viz., it is the only nervous structure which is completely transparent. By employing staining methods that do not interfere with the general transparency of the retina and color particular nerve cells only, we are able to examine the entire unsectioned retina under the microscope and study its structures in their natural relations. It is evident that in thin sections many existing communications escape us.

¹ From the laboratory of the Berlin University Eye Clinic. Read before the Berlin Society of Psychiatry and Nervous Diseases, March 8, 1897.

The chief stain which is applicable here is Ehrlich's methylene-blue method of staining living tissues. Other methods, such, for example, as that of Nissl, allow us to study the structure of the cell body better, but no method brings out the protoplasmic processes so beautifully and completely as Ehrlich's. This method has been much employed in studying normal conditions, but for the pathology of the cell it has not, to my knowledge, been used, and I believe that its use in the examination of pathological cases, such as tabes, paralyses, inflammatory atrophy, etc., would best give us a clearer idea as to the purpose of the protoplasmic processes of the nerve cells—whether they serve for nutrition or conduction—and like questions.

Ehrlich¹ introduced the staining fluid into the veins of the living animal, which was killed when the staining process was sufficiently far advanced. As this method proved to be difficult, Dogiel² proposed to stain the retina after death by the following procedure: The eye is enucleated as soon as possible, not later than four hours after death, and divided equatorially, after which the posterior segment is divided by meridional sections. One of the portions of the retina so obtained is stripped off the underlying choroid and spread out on a slide with the nerve-fibre layer upward, and the adherent vitreous is left in place to prevent drying.

Several drops of a $\frac{1}{10}$ of 1 per cent. solution of methylene blue are then allowed to fall on the retina or to act on it from one side. In fifteen or twenty minutes the nervous elements begin to take the stain, as can be seen under the microscope. First the axis-cylinders become stained, then the cells. Frequently several hours are required for all the nervous elements to take the stain.

The process may be hastened by keeping the preparations at blood temperature, and examining it every five or ten minutes until the desired degree of staining is obtained.

Thus far the staining is very simple. It is, however, necessary to stop the stain at the right time and to fix it, which is a matter of greater difficulty. When the staining

¹ Ehrlich, *Deutsche med. Wochenschr.*, 1886, No. 4.

² *Arch. f. mikroskop. Anatomie*, xl., p. 34.

fluid is allowed to act too long, the capillaries take it up, and finally so many structures become stained that the individual cells are no longer distinguishable. Before fixing the stain, the vitreous is to be carefully removed.

Fixing methods have been proposed by Dogiel, Apáthy,¹ and Kallius,² but a very valuable method is that of Bethe.³ The superfluous stain is washed off with salt water and the fixing fluid poured over the preparation, which is then covered.

The composition of Bethe's fluid is as follows :

Ammonium molybdat.....	1.00
Aquæ dest.....	10.00
Hydrogen peroxid.....	1.00
Acid. hydrochlor. offic.....	1 drop.

This solution does not keep longer than a week. It is best to use it as cold as possible, keeping it on ice. The fluid is allowed to act cold for 2-3 hours, and then to remain longer at the ordinary temperature of the room. After this the preparation is washed for $\frac{1}{2}$ -2 hours in distilled water, to remove the ammonium molybdate, and then dehydrated quickly with alcohol, cleared in xylol or oil of cloves, and mounted in Canada balsam.

When a retina is stained in this way, the observer sees at once, and in every case, broad, dark, horizontal strands, which take the stain quickly and most resistantly retain it. At each end of these strands, which are of various lengths, is found a large cell. I first saw these structures in an atrophic retina which I was examining with Dr. Andogsky. In this case the fine protoplasmic processes of the ganglion cells had mostly broken down, and the protoplasmic strand joining the two ganglion cells therefore appeared more distinct (Figs. 2 and 3, Plate VI.).

We were not able to understand this condition until we recalled Dogiel's illustrations in *Archiv. f. Anat. u. Physiol.*, 1893. He in that place first described such communications between two nerve cells of the retina.

¹ *Zeitschr. f. wissenschaft. Mikroskopie*, ix.

² *Anatomische Hefte*, iii., 10, 1894.

³ *Arch. f. mikrosk. Anatomie*, xliv., 1895.

From one nerve cell there arises a protoplasmic process which is thicker than all the others. This runs directly, without division, and retaining its original thickness, to a neighboring cell. The length of these processes varies greatly. Not only are cells lying close together joined in this way, but also cells lying far apart. This process is very much larger than the other processes, and, under a high magnifying power, it is seen to be composed of a great number of fine fibrils, some of which arise from the substance of each cell and run to the other. In some cases a few fibrils do not run from cell to cell, but, passing out from the process, end free (Fig. 1, *e*, Plate VI.). The fibrils do not run parallel to one another, but deviate, and even assume a corkscrew-like course.

These connections between the cells are found chiefly in the region of the macula, but they are not frequent, and but few cells are joined in this way. Only one of the two cells has an axis-cylinder process, and this cell is usually larger than the other.

All of these cells lie in the ganglion-cell layer, in which Dogiel differentiates three varieties of nerve cells. These cells differ, first, in the manner in which their processes branch; second, in the size of the area through which their processes extend; and, third, as regards the situation in the inner reticular layer of the terminal branches of their processes. The cells differ also in size and form.

Rámon y Cajal also morphologically distinguishes three varieties of ganglion cells: the giant type, the medium type, and the small type; and the pictures obtained by the methylene-blue method of Ehrlich-Dogiel essentially agree with those obtained by the osmic acid, chromic acid, and silver method of Golgi-Cajal.

Dogiel found direct communication between cells of the second type only, but I have found these communications between the large stellate cells of the first type as well.

As regards the relations of the protoplasmic processes of the nerve cells to one another, the views of different authors are not so uniform.

Dogiel believes that the terminal processes of various

cells unite in making up a network, while Cajal believes that each cell is individual and completely independent of every other cell.

Like Dogiel I have searched in vain to find communications between ganglion cells in the retinas of rabbits and doves. It would seem that they are to be found in the human retina only.

Twin ganglion cells have not been found in my Golgi-Cajal preparations, but this is no doubt due to the fact that in this method, as in all the earlier methods, sections were made, and it would have been a lucky chance indeed if the connection between two cells had been preserved, while in Dogiel's method the entire retina is examined intact.

So far as I know, there is nothing in the literature in regard to twin ganglion cells in the brain or cord, though Dr. Nissl has lately had the kindness to inform me that he has seen such structures.

Cajal's investigations have brought to our notice a variety of cells in the retina running horizontally—the so-called horizontal cells which lie between the outer reticular layer and the inner nuclear layer and seem to have the function of bringing into relation different groups of rods. A similar function is doubtless subserved by the communications between the ganglion cells. Since the retina is a true nervous centre of the central organ, the connections between cells may be considered association connections, and we find that the more highly organized the animal, the more numerous are the associations in the retina; the higher associations, viz., the communications between the ganglion cells, exist only in the most highly developed retina, that of man.

Explanation of the figures on Plate VI.

TWIN GANGLION CELLS OF THE HUMAN RETINA.

FIG. 1.—Stellate cells of the first type. Staining of the living tissues by the methylene-blue method of Ehrlich-Dogiel. Fixation by Apáthy's method.

- a.* A cell without an axis-cylinder process.
- b.* A cell with an axis-cylinder process.
- c.* Axis cylinder.

- d.* Connecting tract.
- e.* Subsidiary twigs of the connecting tract.
- f.* Varicosities of the protoplasmic twigs.

TWIN GANGLION CELLS OF AN ATROPHIC HUMAN RETINA.

FIGS. 2 AND 3.

Leitz, Oc. 1, obj. vii.

Staining by the Ehrlich-Dogiel method. The protoplasmic twigs are mostly broken down.

FIG. 2.—Connection between two distant ganglion cells. The tract is swollen and beginning to degenerate. Only slight remnants of the protoplasmic twigs are present.

FIG. 3.—Connection between two adjacent ganglion cells, the axis cylinder in process of degeneration.

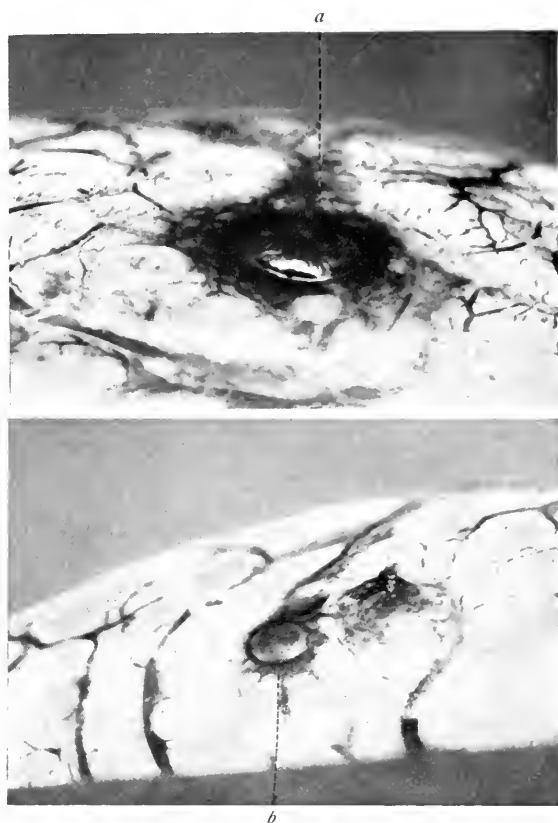


FIG. 1. Metastatic gliomatous nodule on surface of cerebral cortex. *a*, on right side; *b*, on left side.

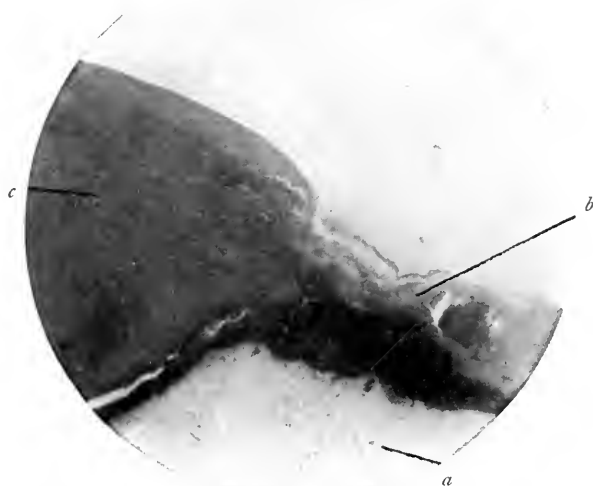


FIG. 2. Section, under low power ($\times 15$), of metastatic nodule, showing situation of nodule beneath the arachnoid, with large and small hemorrhages. Cerebral tissue unaltered. *a*, cerebrum; *b*, subarachnoid infiltration; *c*, edge of nodule.

CASE OF GLIOMA RETINÆ AND BRAIN METASTASES, WITH AUTOPSY AND REVIEW OF LITERATURE.

BY DR. F. M. WILSON, BRIDGEPORT, CONN., AND
DR. EDGAR S. THOMSON, NEW YORK.

(*With text-plate I.*)

Albert M. L.—, age four (Aug. 24, 1898). Small, badly nourished, but somewhat precocious child. Father and mother healthy. Three other children healthy. His eye has “been bad” for four weeks, but they have suspected that something was wrong with it for two months. Child has lost flesh, has nose-bleed, throws up its food, is very fretful, and stays in bed most of the time.

Right eye has ciliary injection; dilated pupil. Tension + 1. *Gray* appearance back of lens, with a fissure running through it. It looks like detached retina covered with exudation. Boy has some pain in right eye all the time. Left eye normal. Enucleation advised and declined.

Dec. 22, 1898.—Have seen him occasionally since August, as have also other oculists, with universal advice for enucleation.

Right eye now has beginning anterior staphyloma. The iris and lens are pressed forward against the cornea; the lens is opaque. The general condition of the child is not much changed. Left eye normal.

Dec. 26th.—The right eye was enucleated at the Bridgeport Hospital. The enucleation was easy. The globe was not ruptured. There was no gliomatous mass in the orbit. Four days later, child was taken ill with scarlet fever, and was quarantined for three weeks. Was not very sick. The orbital wound healed kindly.

I did not see him again until March 1, 1899. His parents said

that for a month after leaving the hospital he gained in flesh, played with the other children, and had no pain whatever. Then pain returned in the right orbit, he lost what flesh he had gained, began to throw up his food again, and to stay in bed. A nodular mass can be distinctly felt in the orbit. Under ether, mass was found to fill posterior half of orbit. Evisceration of orbit was advised and done. For two weeks after the operation he was free from pain and nausea, but did not gain strength.

On March 15, 1899, sight began to fail in left eye, and within two or three days failed entirely, there being no P. L. Pupil was moderately dilated and immobile. No gross changes in fundus.

On March 28, 1899, he had a profuse discharge of a thin fluid from the nose, but his mother, the only person who saw it, does not give a very intelligent account of its appearance or amount. Immediately after this discharge of fluid the left pupil regained its normal size, but was again dilated within six hours.

April 1, 1899.—5 P.M. he died.

Autopsy at 10 P.M., five hours later. Dura mater firmly adherent to vertex. Blood-vessels on surface of cerebrum engorged with blood. Very abundant thin fluid, with flocculi in it, at base of brain. Base and sides of brain studded with round nodules of tissue, which presented the same macroscopic appearance as the tissue which was taken from the orbit. The chiasm was enclosed in a clot of blood, occupying an area of $1\frac{1}{4}$ inches in diameter, and about $\frac{1}{4}$ in. thick at its thickest part. From the right orbit an irregularly shaped mass projected into the cranial cavity, lapping over on to the cribriform plate.

The membranes at base were soaked and softened. Most nodules were entirely distinct, with no apparent connection between them, and were evidently metastatic. The *left* optic nerve, except for a distended sheath, looked normal. Examination of other parts of the body not allowed.

PATHOLOGICAL REPORT.—It is commonly supposed by many of our colleagues that glioma metastases are rare. A literary search, suggested by the editor of these ARCHIVES, shows this not to be true, and we believe the results will be of interest to many ophthalmologists.

The eye, which measured 24 mm in length, was sectioned horizontally, and showed the following points: lens opaque, pupil widely dilated, anterior chamber obliterated, ciliary body

atrophied, retina totally detached in "funnel" shape, and closely applied to posterior surface of lens, vitreous absent, a large mass of new growth near the posterior pole involving the nerve and almost filling the posterior half of the vitreous chamber, the remainder of which is filled with a greenish sero-fibrinous fluid.

Microscopical section shows all the above conditions in detail. The mass is composed of round cells with large nuclei, embedded in a scanty intercellular substance. It springs from the retina somewhere near the nerve, and has pushed outwardly, causing an early detachment of the retina. There are numerous clusters of round cells near the ciliary region and scattered areas through the serous effusion. The choroid is infiltrated posteriorly and enormously distended, so that the tapetum nigrum runs through the middle of the mass; there are traces of choroidal tissue to the outer part of the mass. There are numerous newly formed blood-vessels all through the tumor, and in the older part (*i. e.*, retina) there are large areas of necrosis with hemorrhages. The optic nerve is infiltrated with round cells, and the subdural and sub-arachnoid lymph spaces are also full of cells. There are a few indications of the growth along the blood-vessels which perforate the sclera.

Diagnosis. — *Glioma Retinae Exophytum.*

Secondary orbital growth consists of round cells in small nests throughout the orbital tissue. It resembles closely the original growth, but has not had time to permit it to degenerate.

Cerebrum. — The specimen was hardened in formalin and showed the following points: cerebrum of normal size, membrane adherent in places; a large area of necrosis on the under surface of the right frontal lobe, triangular in shape and extending from the longitudinal fissure and the anterior extremity of the lobe back to the optic commissure and the fissure of Sylvius, which latter it penetrates slightly; an interstitial hemorrhage in the frontal lobe about 3 cm in diameter adjoining the necrotic area. The right optic nerve, as far back as the chiasm, is thickened and infiltrated. On the *right cortex*, 2 cm above the anterior point of the middle lobe, is a round nodule 6 mm in diameter with several smaller nodules near by. A similar nodule is on the *left cortex* 3 cm above the middle of the fissure of Sylvius (see accompanying figure). The necrotic mass at the base shows a structure similar to the original growth. The cells have the same size and shape, and the new vessels are numerous and have the

usual imperfectly formed wall. There are large areas of hemorrhage and necrosis. The right nerve as far back as the chiasm is entirely replaced by glioma cells, no trace of the nerve structure remaining. The subarachnoid space of the chiasm and left nerve is filled with cells. The nerve tissue of the chiasm, beyond a few evidences of sclerosis, is normal. Both nodules on the cortex show a similar structure to the rest of the growth. The cells dip down deep into the fissures, and the subarachnoid space, for some distance about the nodules, is filled with cells. The cerebral tissue is normal, but in places the growth appears about to follow the vessels into the cerebral substance. The retinal cells, while varying slightly in size, have the typical size and appearance of glioma cells, as have also those of the nodules on the cortex and the necrotic mass at the base. The cells in the choroid and in the orbital growth are considerably larger, as a rule, and look more like sarcoma cells. They have larger nuclei and more protoplasm. It would seem as if the glioma cells had started a proliferation in the connective tissue of the choroid and orbit. There are also, in both of these portions of the growth, a few imperfectly formed spindle cells.

The recurrence, in all probability, took place in both the nerve and the orbital tissue. It would seem that the mass at the base must have come from a direct continuation of the growth, while the nodules were, of course, metastatic. The cerebral hemorrhage was no doubt the immediate cause of death.

It was impossible to demonstrate the neuroglial character of the cells, as the tissue was not fresh enough when obtained.

Glioma metastases have not been commonly observed. With the aid of Wintersteiner's book, *Das Neuroëpithelioma Retinæ* (Leipzig u. Wien, 1897), and Knapp's ARCHIVES (English edition) I have been able to look over 530 cases covering a period from 1767 to 1899. Out of these, sixty-one cases of metastases are recorded, as tabulated below :

1. Schneider (*Dissert. Inaug. de Fungo Hæmatode*, Berlin, 1821) reports a case with subperiosteal metastases on the right temporal bone. The left eye was the seat of the original glioma.

2. The same author reports a case with "subperiosteal soft swellings" on the outside and inside of the cranium.

3. Lerche (*Vermischte Abhandlungen aus d. Gebiete der Heilkunde von einer Gesellschaft prakt. Ärzte in Petersburg*, i., Samml.,

Nr. 14, 1821). A case, No. 3, with a nodule on the left zygoma. No sections made.

4. Hasse (*Diss. Inaug. de Fungo Medullari*, Berlin, 1823). A case with cranial metastases.

5. Panizza (*Sul fungo midollare dell'occhio*, Pavia, 1826). A case with metastasis to the parietal bone, parotid gland, and right anterior lobe of the brain.

6. Weller (*Die Krankheiten des menschl. Auges*, 4 Aufl., Berlin, 1830). A case of metastases to the cranium, "outside and inside."

7. Middlemore ("Observations on Fungus Hæmatodes of the Eye," *Lond. Med. Gazette*, vol. vi., p. 878, 1830). A case with metastatic enlargements in the liver and kidneys, glands of the mesentery, and one rib.

8. v. Zimmermann (*Abhandlung über den Markschwamm*, Wien, 1832). A case with cranial metastases. Optic nerves not involved.

9. Lawrence (*A Treatise on the Diseases of the Eye*, p. 627, 1833). A case with direct extension to the brain from the left eye. Metastases in the anterior mediastinal glands and in the fourth, fifth, and sixth ribs of the right side.

10. Mühry (*Ad parasitorum malignorum imprimis ad fungi medullaris oculi historiam symbolæ aliquot*, Göttingen, 1833). A case with metastases to the cheek and under jaw.

11. Donegana ("Über den Markschwamm insbes. des Auges, eine nachgelassene Abhandlung," Herausgeg. von Mocchetti, *Anatologia Med.*, December, 1834). A case with metastasis to the cranial bones and right frontal lobe of the brain.

12. Sichel ("De l'encéphaloïde et du pseudo-encéphaloïde de la rétine et du nerf optique," *Iconographie ophthalmologique*, p. 562-588, 1859). A case, No. 3, with metastases in the lymph glands of the mesentery.

13. Vernon and Bowater ("Soft Glioma," *Royal Lond. Oph. Hosp. Rep.*, vol. vi., 2, p. 155, 1868). A case, No. 3, with metastases in the cranium, brain, and glands behind the right ear.

14. Schiess-Gemuseus and Hoffman ("Beiderseitiges Netzhautgliom," *Virchow's Arch. f. pathol. Anat.*, Bd. xlv., 3, p. 286, 1869). A case with cranial metastases, subperiosteal and subdural; also in the upper and lower jaw-bones. Metastases in the liver and retroperitoneal glands.

15. Hjort and Heiberg ("Zur Malignität d. Glioms," *Arch. f.*

Oph., xv., 1, p. 184, 1869). A case with metastases on the frontal bone, temporal lobe of the brain and membranes, and choroidal plexus.

16. Knapp ("On Intraocular Tumors," p. 23, 1869) reports a case in a child eighteen weeks old. The right eye was enucleated and the optic nerve found normal. The left eye was also slightly affected and in two years perforated. At that time six nodules were found in various places on the cranium. Two weeks later the child died and the autopsy showed the cranial nodules to be gliomatous. Other metastases were found in the brain, liver, and lymph glands.

17. Heyman and Fiedler (*Arch. f. Oph.*, Bd. xv., 2, p. 173, 1869). A case with metastases in the ovaries and retroperitoneal glands. Other metastases on the cranium.

18. Battmann (*Diss.*, Leipzig, 1870). A case of bilateral glioma with metastases in the region of the cheek, on the forehead, on the upper jaw, on the sella turcica, and other parts of the cranial cavity.

19. Delafield ("Tumors of the Retina," *Trans. Am. Oph. Soc.*, p. 73, 1870). A case, No. 3, with metastasis to the chiasm. Enucleation, with resection of the optic nerve, was done. Recurrence after four months.

20. The same author reports a case, No. 5, of metastasis to the pericranium. The original lesion had existed six months. Exenteration of orbit. Recurrence after six weeks. Death after three months.

21. Wadsworth ("A Case of Intraocular Glioma," *Trans. Am. Oph. Soc.*, p. 11, 1873). A case with metastasis to the lower jaw and cranium.

22. Torday ("Ein Fall v. Gliosarcom.," *Pester med. chirurg. Presse*, No. 50, p. 785, 1873). A case with metastases on the glabella and right temporal region.

23. Norris (*Phil. Med. Times*, Feb. 8, 1873) reports a case in which a local relapse in the orbit took place, with the formation of cranial nodules similar to the two cases reported by Knapp. No nodules were found in the brain.

24. Knapp (*ARCH. OF OPH.*, 1874-5, p. 1) reports a case with numerous metastatic nodules on the cranium originating between the periosteum and the surface of the bone.

25. Zincke ("Gliom beider Augen," *The Clinic*, Aug. 8, 1874). A case with metastasis in the region of the left ear, extending

forwards to the ala of the nose and angle of the mouth, and upwards to the roof of the orbit.

26. Crespi (*Gazetta medica Italiana-Lombardia*, Nr. 26-28 and 43, 44, 1876). A case with metastasis to the brain.

27. Rusconi ("Rendiconto del R. Istituto Lombardo, Serie II., Vol. iv., Fasc. vi.," *Rivista clinica di Bologna*, Giugno, p. 169). A case of bilateral glioma with numerous secondary nodes of very considerable size on the cranium and in the liver, and smaller ones in the right kidney and in the ovaries. Nodules were also found on the ribs and clavicle.

28. Arcoleo (*ibid.*). A case of secondary tumors on the cranium.

29. Hosch ("Einseit. Netzhautgliom mit multiplen Metastasen," *Klin. Monatsbl. f. Aughkl.*, p. 114, 1878). A case with numerous metastases on the face, cranium, and ribs, and in the cervical glands. The mass had penetrated the sclera, and the head of the optic nerve was involved, although $2\frac{1}{2}$ cm behind the globe the nerve was normal.

30. Schöнемann ("Beitrag zur Casuistik des Glioma Retinæ," *Inaug. Diss.*, Marburg, 1880). A case in which death occurred eight months after exenteration and cauterization of the orbit. There were metastatic nodules on the angle of the lower jaw, but no local relapse.

31. Lemcke ("Über Glioma im Cerebrospinalsystem u. seinem Adnexen," Langenbeck's *Arch. f. Klin. Chirurgie*, Bd. xxvi., H. 3, p. 525, 1881). A case with metastasis to the jaw-bones.

32. Vetsch ("Über Glioma Retinæ," *Arch. f. Aughkl.*, xi., p. 413, 1882). A case, No. 9, with metastasis to the brain and liver.

33. He also reports a case, No. 21, with metastases in the forehead.

34. He also reports a case (*Arch. Oph.*, vol. xii., p. 59, 1883) in which a relapse occurred, four years after the enucleation of the right eye, in the right parotid gland. Examination showed glioma structure somewhat modified, and excision was successful in preventing a relapse.

In the same paper he cites a case seen in 1862, which he says died from metastasis to the liver with dropsy. There was no autopsy.

35. Meisenbach ("Report of a Case of Gliosarcoma," *St. Louis Med. and Surg. Jour.*, xlv., p. 351, 1883). A case with metastasis to the left scapula and the long bones, especially the lower

end of the left humerus, the ulna, and the radius. Cervical and inguinal glands enlarged.

36. Santos Fernandez ("Gliome ossifiant de la rétine," *Courier med.*, Nr. 1, 1883, and *Recueil d'oph.*, p. 485, 1883). A case with metastases, the locations of which are not mentioned.

37. De Vincentiis (*Ann. d'Ott.*, vol. x., fasc. 4 e 5). A case, six years old, with numerous cranial metastases. Also metastasis to the parotid and cervical glands, and one nodule on the spleen.

38. In the same paper he reports a case of parotid metastasis which was operated upon,—successfully as far as the author knows.

There are three other cases with autopsy reported. No metastases.

39. Dickey (*Am. Jour. Med. Sci.*, p. 486, October, 1884). A case wherein metastatic tumors began on the cranium six weeks after enucleation of the eye.

40. Chisolm (*ARCH. OF OPHTH.*, vol. xiii., p. 47). A case in a child two and a half years old with very extensive cranial metastases. Microscopical examination was not made.

41. Snell ("Retinal Glioma," *Brit. Med. Jour.*, 1884, vol. ii., p. 563, and *Med. Times and Gazette*, vol. i., p. 401). A congenital binocular case, No. 2, with metastases to the frontal bone. The right eye was enucleated and three years later the left. Recurrence took place in the left orbit after twelve months.

42. Rompe ("Beitrag zur Kenntnis des Glioma Retinæ," *Inaug. Diss.*, Göttingen, 1884). A case, No. 3, with metastases in the base of the brain, in the chiasm, and along the blood-vessels.

43. Lukowics ("Beitrag zur Prognostik des Glioma Retinæ," *Inaug. Diss.*, Halle-Wittenberg, 1884). A case, No. 15, with metastasis to the frontal bone.

44. Little ("A Case of Glioma of the Retina—Double Congenital," *Trans. Am. Oph. Soc.*, 1885, p. 717). A case with metastasis to the submaxillary gland.

45. Fouchard ("Du gliome de la rétine," *Thèse de Paris*, 1885). A case, No. 2, with metastasis to the parotid and cervical glands, which show structure similar to the original glioma.

46. Brailey (*Trans. Oph. Soc. of the Un. King.*, 1885, p. 61, and *Lond. Lancet*, ii., p. 1085, 1885). A case with parotid and submaxillary metastases.

47. Da Gama Pinto (*Untersuchungen über Intraoculare Tumoren*, Wiesbaden, 1886). A case, No. 9, with metastases on the

cranium which extended to the dura. Other metastases in the parotid gland and lungs.

48. Capron (*Trans. Am. Oph. Soc.*, 1888, p. 106). A case with swelling of the cervical glands before death (most probably metastases).

49. Bochart ("Untersuch. über das Netzhaut-Gliom," *Inaug. Diss.*, Königsberg, 1888). A case with metastasis to the parotid and a supposed metastasis to the lower epiphysis of the ulna.

50. Lawford and Treacher Collins (*Royal Lond. Oph. Hosp. Rep.*, vol. xiv., p. 51, 1895). A case, No. 2764, with metastases to the brain and spinal cord.

51. Gunn and Treacher Collins ("Curator's Report on Cases of Pseudoglioma," *Royal Lond. Oph. Hosp. Rep.*, vol. xiii., 3, p. 361, 1893). A case with metastases to the parietal bone.

52. Lawford and Treacher Collins ("Curator's Report on Cases of Pseudoglioma," *Royal Lond. Oph. Hosp. Rep.*, vol. xiv., p. 51, 1895). A case with metastasis to the right frontal bone.

53. Schmitz ("Beitrag zur Lehre vom Glioma Retinæ," *Inaug. Diss.*, Kiel, 1891). A case with metastases in the cervical glands on the right side.

54. Bull ("Case of Traumatic Iridochoroiditis, . . . Ending in Glioma," *Trans. Am. Oph. Soc.*, 1892, p. 335). A case with glandular swellings, which seem most probably to have been metastases.

55. Becker ("Beitrag zur Kenntnis des Netzhautglioms," *Arch. f. Oph.*, xxxix., 3, p. 280, 1893). A case, No. 3, with metastases of the chiasm and base of the brain.

56. Wolff ("Über den Markschwamm der Netzhaut," *Inaug. Diss.*, Berlin, 1893). A case, No. 16, with a metastatic tumor the size of a walnut in the optic chiasm.

57. Blumenthal ("Ein Fall von Glioma Retinæ," *St. Petersburg Medicin. Wochenschr.*, 1893, Nr. 1). A case with metastases in the preauricular and cervical glands. Also large nodules in the liver and on the sternum.

58. Van Duyse (Un cas de gliosarcome de la rétine avec récive et metastases colossales, *Arch. d'Oph.*, T. xiv., Nr. 2, 1894). A case with a large metastatic "retro-maxillary" tumor.

59. The same author reports a case with cranial and liver metastases.

60. Treacher Collins ("Curator's Report," *Royal Lond. Oph. Rep.*, xiv., p. 51, 1895). A case, No. 15, with metastases in the brain and on the nape of the neck.

61. Wintersteiner (*Das Neuroepithelioma Retinæ*, Leipzig u. Wien, 1897, p. 442). A case, No. 26, with cranial metastases.

RECAPITULATION.

Total number of cases from 1767 to 1899.....	530
Metastases in.....	61
Cranial and facial bones.....	38
Brain (including chiasm 4).....	13
Lymph glands, mesenteric, mediastinal, inguinal, etc....	10
Parotid gland.....	8
Cervical glands.....	7
Skeletal bones.....	7
Liver.....	7
Submaxillary gland.....	2
Ovaries.....	2
Kidneys.....	2
Spleen.....	1
Lung.....	1
Spine.....	1
Location not mentioned.....	1

A CASE OF CONGENITAL IRIDEREMIA.

BY ROYAL S. COPELAND, A.M., M.D., ANN ARBOR, MICH.

NOT so many cases of irideremia are reported, that the report of a new one should be without interest. A case of this malformation recently fell under my observation.

Dean B., aged three months, is the fourth child of Robert B., aged thirty-three, and Mary B., aged thirty. The other children are apparently normal in every respect, and the parents present no evidences of abnormality. So far as possible to learn, there have been no harelips, eye defects, or congenital anomalies of any sort in either family.

Examination in the dark room revealed entire absence of the iris. The edge of the lens and the suspensory ligament were clearly visible in each eye. The media were clear, and the details of the fundus readily seen. Aside from the absence of the irides the eyes seemed entirely normal.

ATTEMPTED EVULSION OF BOTH EYES BY AN INSANE PATIENT.

BY DR. DAVID COGGIN, SALEM, MASS.

Nov. 14, 1892.—Alfred T., aged thirty years, an Englishman, while in a state of religious excitement, had tried to pluck out his eyes. When seen on the following day, the cornea and the membranes of the right eye were adhering to the nose—the eyeball having been completely eviscerated. Lens not found.

The internal rectus muscle of the left eye had been torn from its insertion. Slight exophthalmus.

The anterior chamber was filled with blood. Apparently there was no vision.

Sutures were introduced in the sclera of the right eye (which had been so deftly resected by the victim's finger-nails) in order to make the cicatrix vertical. The left *internus* was shortened—the tendon being elongated—and sutured as in the ordinary operation for advancement.

Healing process normal. A granulation button, however, was excised over the seat of the advanced tendon.

A month later the anterior chamber and pupil seemed normal. Cornea wrinkled, the radii converging towards the insertion of the internal rectus, at which point there was a tendency towards a staphyloma. Fair projection in and down. Behind the lens and in contact with it was a dirty white membrane (presenting no undulatory movement), on the surface of which two small blood-vessels coursed.—T. Whether there was a detached retina or a plastic exudation was not determined. Subsequently the lens became opaque and an attempt was made to perform a linear extraction. A portion of the lens had undergone a cretaceous change and being adherent it was left behind. The cornea collapsed, it was so tenuous. A pupillary membrane formed which was divided with two needles, but the incision failing to gape, Loring's procedure was afterwards carried out. Later, through the opening there was made out a red reflex above—but the eye was blind. The patient remains in a lunatic hospital, though his former state of excitement has subsided.

REPORT OF THE SECTION ON OPHTHALMOLOGY AND OTOTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE, OCTOBER 16, 1899.

By DR. J. HERBERT CLAIBORNE, SECRETARY.

THE PRESIDENT, DR. PETER A. CALLAN, IN THE CHAIR.

A microscopic specimen of the **conjunctival fold** which is found in some cases of **trichiasis** was demonstrated by Dr. RUDOLPH DENIG. The speaker referred to the description of this condition (congenital distichiasis) by Harlan and Shapringer, and said the specimen showed that there must have been an inflammation between the middle and inner part of the lid in fœtal life.

Dr. W. B. MARPLE showed a case about which he requested the opinion of those present. The case was that of a child who squinted four months ago. Examination of the eye showed it to be blind. There was posterior synechia and discoloration of iris tissue. Tension was normal. There was a white reflex from the fundus. He entertained the ideas of **glioma** and **iridochoroiditis**. The patient had had scarlet fever, which suggested metastatic choroiditis.

Dr. D. WEBSTER thought it a case of metastatic choroiditis and urged enucleation in order to save the other eye.

Dr. E. GRUENING also thought it a case of metastatic choroiditis, but did not approve of enucleation. He did not think the case exhibited the symptoms of glioma.

Dr. H. KNAPP diagnosed the case as one of metastatic iridochoroiditis, with no danger to the other eye.

Dr. G. H. COCKS said he had seen a similar case in the Eye and Ear Infirmary. The unpleasant symptoms gave way to atropine and hot water.

Dr. J. H. CLAIBORNE presented a case for Dr. Thomas R. Pooley.

The case had been referred to in the minutes of the preceding meeting. It was that of a young woman who had had **herpes zoster ophthalmicus**. The scars on the brow were marked. Dr. Claiborne called attention to the corneal infiltration which was left as a result of ulceration of the cornea. The infiltration had become very much less under treatment and he considered it probable that the infiltration would largely disappear. He wished to know the prognosis of those present as to its complete disappearance.

Dr. CLAIBORNE also showed a case of typical **Bright's retina** for Dr. Pooley. He said that it had been the intention of Dr. Pooley to make some remarks upon the prognosis of Bright's disease in connection with the typical lesion of the fundus. The patient had been under observation for more than two years, and under treatment of tannate of iron and iodide of potash. The patient looked very well and apparently was very comfortable from a physical standpoint.

Dr. CLAIBORNE also showed a case in which there was **injury of the lens**; a piece of tin entered the eyeball, and was followed by subsequent cataract and glaucoma which was almost total. An iridectomy was performed and a large portion of the lens substance was expressed, until the pupil appeared perfectly black. There was subsidence of tension and rapid recovery took place under the bold use of atropine.

Dr. CLAIBORNE also showed a case of **partial dislocation of the lens into the anterior chamber**. This was the condition when the case was first seen three weeks previously. The man had been struck on the eye with a stick. The lens was dislocated downward into the posterior chamber. The anterior chamber became shallow, and glaucomatous tension supervened. Subsequently the lower portion of the lens fell into the anterior chamber through the pupil. Dr. Claiborne thought the case interesting in that at the time he examined it the lower edge of the lens could be seen as a yellowish-brown crescent, best observed by direct daylight. It could be seen also by artificial illumination with the binocular magnifying-glass of Dr. Edward Jackson of Philadelphia.

Several gentlemen who examined the case stated that the lens was no longer in the anterior chamber. Dr. Claiborne said that he had not seen the case for three weeks and therefore could not speak of it at the present time.

Referring to Dr. Claiborne's case of dislocation of the lens, Dr. TANSLEY referred to a boy who had had dislocation of the lens after being struck with a small piece of wood. Iridodonesis was present. Vision was finally $\frac{2}{30}$ and the symptoms of dislocation disappeared.

Dr. M. L. FOSTER read a paper on **ptosis**. After considering the etiology of ptosis he divided the causes of the condition as follows :

1. Acquired : (*a*) from overweight of the lid due to hypertrophy, accumulated fat, or superabundance of skin ; (*b*) spasm of the orbicularis ; (*c*) paralysis or paresis due to traumatism to the lid or to the motor nerve of the levator palpebræ, to disease, peripheral or central, involving the motor nerve of the levator palpebræ, or to hysteria.

2. Congenital : (*a*) from overweight of the lid ; (*b*) paralysis or paresis from imperfect muscular development of the levator or imperfect innervation of the levator.

The operations for the relief of ptosis were classified as follows :

1. Removal of a portion or shortening of the skin of the lids with or without removal of subcutaneous tissue.

2. Interference with the action of the orbicularis.

3. Advancement of the levator palpebræ.

4. Substitution of the action of the occipito-frontalis for that of the levator : (*a*) by indirect union of the tissue of the lid to the tendon of the occipito-frontalis by means of artificial cicatricial tendons or of permanent sutures ; or (*b*) by direct union of the tissues of the lid to the tendon.

5. Substitution of the action of the superior rectus for that of the levator.

The author said that all cases of ptosis do not demand operation. When operative interference is necessary, operation should be determined by a consideration of the cause in the individual case. Employment of the first class of operations is to be deprecated except in cases which are classified as "*a*" in the congenital and acquired forms, while that of the second should be confined to "*b*" of the acquired. These operations are too often performed when the levator is at fault. Advancement of the levator is rational when the levator appears to have a contractile power and proper innervation. The operations included in the third class are two of Bowman's, Boucheron's, Heistrath's two of

Wolfe's, Gillet de Grandmont's, Everbusch's, Abadie's, Snellen's, and Nicati's. He said that Wilder's forms a connection between the third and fourth classes.

The use of suture of the tendon of the occipito-frontalis was proposed independently by Dransart and H. Pagenstecher ; and, while this is an improvement on previous methods, it is not satisfactory. The author referred to de Wecker's modification of Dransart's and von Graefe's. The first mention of the use of a metal suture for this purpose was made by Gayet in 1891, but in 1895 Mules brought its use prominently forward. Darier's operation was criticised as being inefficient. Due credit was given to Hunt for utilizing the occipito-frontalis without detracting from the originality of Panas's operation. He referred to the latter as difficult and complicated. Tansley's operation was considered a combination of the old modification of Hunt's rather than of Panas's. A modification of Panas's operation by Van Fleet appealed to the writer as the most satisfactory of all operations. He said that the fifth class was represented by two operations, both made public in the summer of 1887, one by Motais, the other by Parinaud. The fifth class of operations seemed contraindicated when there was paralysis or paresis of the superior rectus.

Discussion.

Dr. HEPBURN said he had seen the best results from Van Fleet's operation in the Manhattan Eye and Ear Hospital. He did not consider Panas's operation very easy. He thought that the deepening of the incision into the periosteum by Van Fleet was a good measure.

Dr. TANSLEY said he had not tried Dr. Van Fleet's operation. He said he never could advance the levator palpebræ, because he never could find it. He had also tried subdermal sutures. He had found von Graefe's operation of no value. He was accustomed to combine Panas's operation with von Graefe's, and had done this in several cases.

Dr. VAN FLEET said he wished it distinctly understood that he made no claim to originality in the operation which has been attributed to him. In attempting to carry out the Panas operation, and being unable to understand the idea completely, he had modified the operation as had been described. His object was to put the lid under the control of the occipito-frontalis. The lines in his operation are straight, as opposed to those of Panas, which

are curved. Panas's operation will necessitate a slough, while his modification prevents it. He considered that there is no such thing as an ideal result, but that the operation as performed by him would raise the lid and make a sightly eye. He considers the operation which he performs Panas's operation.

Dr. A. E. DAVIS had performed Van Fleet's operation three times. In this operation the lid does not tend to go lower. He thought that the sulcus produced by this operation was good, and that the brow incision was good. He also thought that the operation of Van Fleet could be done under cocaine anæsthesia.

Dr. H. KNAPP said he did not consider von Graefe's operation so bad as had been indicated. He cited an extreme case of old ophthalmoplegia syph. of both eyes in which it had been done over fifteen years ago, and the eyes permanently brought into view. He considered von Graefe's operation a question of measurements. He did not like the pouch produced by the Panas operation.

Dr. E. GRUENING had seen good results from von Graefe's operation, and did not condemn it. He described on the black-board his method of passing a suture into the tarso-orbital aponeurosis. He could not regard the operation of Panas favorably. With a combination of the von Graefe operation and Panas's, reefing of the lid would produce a good result. He spoke of Wolfe's operation and also that of Hotz as giving good results.

Dr. D. WEBSTER had had no experience with the operation of Van Fleet, or with that of Panas. He had done twelve operations for ptosis during the past thirty years, and was accustomed to follow the method employed by the late Dr. Agnew, *i. e.*, removing a strip of skin the length of the upper lid and removing the subcutaneous tissue. He had not obtained uniformly good results. He had noticed that Van Fleet's operation in the Manhattan Hospital had sometimes caused great traumatism and reaction. He intended in the future to try Van Fleet's operation.

Dr. LESZYNSKY remarked that the operation must necessarily be for cosmetic purposes. He thought that some operated too hurriedly. He had seen unpleasant results follow the operation. He referred to unsuccessful experiments made by himself and the late Dr. Seguin to stimulate the levator.

Dr. FOSTER closed the discussion. He regretted that he had failed to bring with him cases representing Van Fleet's and

Panas's operations. Both were successful, and he desired to compare them. He declared himself much in favor of Van Fleet's operation; thought Panas's quite as easy as the former, but said the descriptions were insufficient. He referred to the fact that Panas did not say that his lines were curved—he simply said "lines." He had not seen puckering and sloughing, which had been referred to. He had failed with von Graefe's operation. He also cited indications for operation.

Dr. KNAPP asked the indulgence of the Section for a few moments to refer to a case of **metastatic gonorrhœal conjunctivitis**. He had seen but few of them. The patient was thirty-eight years of age, and one week before had had a gonitis. At first the secretion in the eye was scant and mucous. There were superficial ulcers of the cornea. Repeated examinations of the secretion showed gonococci distinct and characteristic. There was no swelling of the lids at any time. The patient had suffered from a mild form of gleet. The picture was different from the ordinary gonorrhœal ophthalmia. The presence of gonitis and gonococci stamped it as gonorrhœal, and he considered the case one of metastatic gonorrhœal conjunctivitis.

Dr. TANSLEY referred to a case similar to that reported by Dr. Knapp, but he had not examined the secretion bacteriologically.

Dr. VALK thought these cases were not so rare, as he had seen a number of them, but had not examined them microscopically.

On motion the Section adjourned.

REPORT OF THE NINTH INTERNATIONAL
OPHTHALMOLOGICAL CONGRESS HELD
AT UTRECHT, AUGUST 14-18, 1899.

(*Conclusion.*)

BY PROF. R. GREEFF, BERLIN.

Translated by Dr. WARD A. HOLDEN.

NEUSCHÜLER : **The fibres of the optic nerve.**

In his investigations the author made use of thin longitudinal sections of the nerves stained by Weigert's method. The dark-stained fibres run, in general, parallel to one another toward the disc ; but here and there fibres are seen which do not preserve a parallel direction, and leaving the bundle to which they belong pass obliquely into an adjacent bundle. These anastomoses between the different bundles have long been recognized. A new feature was discovered when the region of the lamina cribrosa was examined under a high power. In this location fibres are found similar to the anastomosing fibres mentioned, but differing from them in some particulars. These fibres are found in the region of the lamina cribrosa, particularly at the place where the medullated fibres give up their medullary sheath. They take the stain like the fibres of the nerve trunk but rather more intensely. They are of larger calibre than the other fibres and their course is oblique or almost transverse, so that one fibre may be followed across two or three bundles. These particular fibres are found in the pig, calf, cat, and less frequently in man. Their purpose is not understood.

WICHERKIEWICZ : **A new operation for epicanthus.**

The author gives a detailed description of the operation he had used for several years. He makes two incisions 8-10 *mm* from

the inner commissure, one toward the upper lid and one toward the lower, the two forming an angle of 60-90° with each other. Two other incisions joining the first make a trapezoidal flap which is removed and the wound closed with sutures. The operation is particularly adapted for cases of excessive epicanthus in which the crescentic fold of skin projects over the inner canthus.

CRITCHETT : The operative treatment of conical cornea.

Until seven years ago the author was in the habit of cauterizing the apex of the cone with the galvanic cautery brought to a red heat, and opening the anterior chamber. This method in which only the apex of the cone was cauterized was rather painful. Since 1892 he has modified his procedure and now cauterizes superficially a larger area, avoiding perforation. With a small cautery point brought to a red heat the entire extent of the apex of the cone is cauterized superficially, then with a less heated point a deeper cauterization is made in the middle of the first, care being taken not to perforate the cornea.

The results of this cauterization in two stages are very satisfactory to the author and he commends the operation to others.

CLARK, E. : The union of corneal wounds.

The author endeavored to determine by means of experiments on rabbits how long a time is required for the closure of a corneal wound and how long such a wound permitted the passage of infecting micro-organisms.

Under chloroform and ether narcosis the cornea was pierced, upward, with a medium broad lance and the entire aqueous evacuated. The animals were allowed to die in the narcosis. Even within two or three minutes the anterior chamber began to be restored and in fifteen or twenty minutes it had regained its normal depth. In one case, in which the chamber was restored in fifteen minutes, the aqueous humor was evacuated a second time and again the chamber was restored in five minutes.

In a second series of experiments the animals were released after operation. The restlessness of the animals then delayed the closure of the wound and in some cases the chamber had not been restored after two hours.

The incisions made with a lance cicatrize quickly whether an iridectomy is made or not. When the cornea was split with a Graefe knife in a horizontal direction the margins of the wound applied badly and healing was slow. Wounds in the lower portion of the cornea readily became inflamed and the aqueous grew

turbid, probably from the eye being rubbed with the animal's paws.

In order to test the readiness with which corneal wounds may become infected, cultures of staphylococcus aureus were applied fifteen to twenty minutes after incision with the lance, inoculation of the anterior chamber of the other eye being made with the same culture for purposes of control. These experiments showed that suppuration always occurred when the cultures were applied within forty-five minutes after the incision was made. When applied later no infection occurred.

The author's conclusions are as follows :

1. Wounds of the cornea close in the shortest time when the subject remains for some minutes absolutely at rest. Patients should therefore be transported only on the bed on which they lie when operated upon.

2. If the aqueous escapes too rapidly in the course of the operation and the operation can be completed only with a full chamber, a delay of forty-five minutes will cause the chamber to be restored completely.

MORAX : On the rôle of toxins in the production of conjunctival inflammations.

It is now recognized that, in the greater number of conjunctival inflammations, the inflammatory process is the result of a proliferation of certain micro-organisms (the gonococcus, Weeks bacillus, diplobacillus, pneumococcus, diphtheria bacillus, etc.) either on the surface of the mucous membrane or in its substance. Morax and others (Coppez) have demonstrated as well that the diphtheria toxin on the conjunctiva is capable of producing the symptoms and lesions characteristic of diphtheria.

Morax has extended his investigations on the action of filtered or unfiltered cultures of particular micro-organisms on the conjunctiva of man and the lower animals. Since the sorts of micro-organisms employed do not grow upon the conjunctiva of animals, Morax devised the method of continuous instillation, which led to such interesting results with diphtheria toxin. He allowed a drop of the culture to be instilled into the conjunctival sac of a rabbit every two minutes for several hours, thus securing a more or less permanent contact of the bacteria and their products with the mucosa. The reaction occurs 2-3 hours after the instillation is begun. It is more severe when the culture is unfiltered, the bacteria remaining alive or having been killed by being heated to

53°. When the culture has been passed through a Chamberland filter and the bacteria removed, the reaction is less marked, which indicates that the active substance in part remains in the bacteria themselves, and in part passes out into the culture liquid. Cultures, whether filtered or not, that are exposed to a heat of 120°, lose their effect in great measure. The reaction due to instillations of cultures of gonococci, Weeks bacilli, diplobacilli, and staphylococci is characterized by hyperæmia of the conjunctiva, more or less œdema, and a varying purulent secretion.

When filtered cultures of the gonococcus are used on the human conjunctiva, a long contact is necessary to produce a reaction. Both in the rabbit and in man the reaction first appears 2-3 hours after the beginning of the instillation, and lasts only a few hours after the instillations have ceased. The slowness with which these toxins are absorbed is in marked contrast to that with which certain substances of animal or vegetable origin and alkaloïds are absorbed. Some drops of snake poison will produce a severe reaction in 7 minutes. An equally intense reaction is caused by a solution of abrin, but this does not appear for 20 hours. An explanation of these latter facts is not yet possible.

HERN: The operative treatment of glaucoma.

The author believes that we are justified in operating on every case of glaucoma in which there is the slightest chance of success, because it is known that both acute and chronic glaucoma, without treatment, surely lead to blindness. It is granted that the value of iridectomy in chronic glaucoma is questionable, and many operators abstain from operative interference in these cases. In acute glaucoma the value of iridectomy is unquestionable, and if iridectomy is not efficacious, the valuable operation of sclerotomy remains. The author believes that all cases of chronic glaucoma in which the eye is not already blind should be treated like the acute cases.

By glaucoma the author understands an increase of tension in the posterior segment of the ball, and a proof of the correctness of this view he holds to be the fact that the anterior chamber does not take part in the increase, but the depth of the anterior chamber is, on the contrary, diminished by the pushing forward of the lens. The therapeutic indication is to establish a communication between the vitreous chamber and the anterior chamber, which an iridectomy accomplishes.

If the iridectomy which is first made in every case of glaucoma

does not have the desired result, the author proceeds as follows : A Graefe knife is entered through the cornea 2 *mm* from its margin and in front of the coloboma, and the point passed above the lens back into the vitreous chamber and slightly turned before withdrawal in order to secure as free a communication as possible between the vitreous chamber and the anterior chamber. In some cases the operation leads to cataract, and extraction is required later.

The author's statistics are as follows.: In 34 % of glaucoma cases, permanent recovery after iridectomy ; in 20 %, improvement lasting 1-3 years ; in 10 %, recovery after the author's "antero-posterior sclerotomy" ; in the remaining 36 %, a final blindness in spite of every possible method of treatment.

AXENFELD and BIETTI : Regeneration of the nerves after optico-ciliary neurectomy.

It is a well-known fact that sensibility usually returns after neurectomy. How is this to be explained? In experiments, after resection without adaptation of the cut ends, regeneration mostly does not take place, and when it does it is questionable whether it is direct or vicarious, *i. e.*, depending upon neighboring nerves. The manner of repair also is in doubt, whether the active forces are mechanical or chemotropic. In recurrences after resection of the fifth nerve, the pre-formed bony canal comes into question — elements which are wanting in the case of the ciliary nerves. Therefore, at the suggestion of the author, Dr. Bietti of Parma cut in serial sections an eye which had become painful seven years after neurectomy. The sections were stained by the Weigert-Pal method, which stains directly the medullary sheaths. Special attention was directed to the question whether the regeneration occurred vicariously from the anterior ciliary nerves, which physiologically furnish sensation to the extreme periphery of the cornea only, or directly from behind. In the only case previously reported, that of Schmidt-Rimpler's, the posterior nerves were found to have lost their medulla, and were therefore described as atrophic.

The conclusions were as follows :

1. An extensive direct regeneration occurs from behind.
2. Numerous twigs and single fibres find their way through the sclera into the interior of the eye.
3. A considerable portion of the regenerated fibres in this case did not enter the sclera, but formed a retrobulbar cicatrix-neuroma,

which may have been concerned in the pain. It corresponded to the well-known amputation-neuromas. In such circumstances, sensations may be projected wrongly to the periphery.

4. A portion of the regenerated fibres may lack medulla, and, conversely, medullated fibres may penetrate into the cornea. Therefore, in Schmidt-Rimpler's case, the posterior non-medullated fibres may perhaps not have been atrophic.

5. The anterior ciliary nerves were but slightly developed in this case, and did not participate to any extent in the regeneration.

Other investigations will be required before it can be determined whether these conditions are the usual ones.

GRÓSZ : Neuroparalytic keratitis.

Grósz distinguishes two forms of neuroparalytic keratitis : the first, that which follows disease, compression, injury or resection of the fifth nerve ; and the second, true neuroparalytic keratitis, which proceeds from cachexia, local hemorrhages, or injuries.

The cause of the former is an ectogenous infection, which is facilitated by the dryness and lessened protection against injury which the anæsthesia causes.

The cause of the latter form is an affection of the Gasserian ganglion.

KRÜCKMANN : Does primary carcinoma occur in the interior of the eye, or are there ever primary autonomous epithelial neoplasms ?

The author first describes the known cases of epithelial proliferation in the interior of the eye. He concludes that primary autonomous epithelial proliferations do not exist, because in these cases the proliferation usually followed an inflammation or injury ; they never led to metastases, and never became destructive growths. From many observations of his own, he believed that the process of epithelial proliferation was purely secondary, and that later a development of connective tissue occurred, through which the epithelial products were completely masked. He proposes the term, atypical proliferation, for the tubular and canal-like arrangements of epithelial cells.

SCHRECK and STÖLTING took part in the discussion.

FRANKE : On the pathological anatomy of lepra.

Franke examined three eyes of two patients in different stages of lepra.

In the first case a boy had marginal parenchymatous keratitis.

Bacilli were found in the cornea, ciliary body, and root of the iris. The two other eyes were from an older patient, and both were already in a state of phthisis anterior. The anterior chamber was filled with leprous new-formed tissue, in which iris and ciliary body had been lost. In this new tissue, as well as in the remainder of the cornea, numerous collections of bacilli were found.

The choroid anteriorly exhibited a marked swelling of the suprachoroidea with many bacilli, and the retina anteriorly was greatly thickened by a hypertrophy of Müller's fibres, among which were numerous groups of bacilli.

In one eye the lens was in process of absorption ; in the other, already absorbed.

The posterior portions of the choroid and retina were not much changed, apart from an inflammation of the optic nerve, and no bacilli were found here

UHTHOFF : Contributions to the subject of injury to the eye from glare.

By citing several examples, Uththoff showed how lateral glare might affect central vision, and cited Urbantschitsch's discovery that the coexistence of several excitations increases perception. Schmidt-Rimpler found that moderate lateral illumination improved vision, while intense illumination lessened it.

Uththoff's experiments show that the disturbance of central vision is greater the smaller the angle which the rays entering from the side make with the line of fixation ; furthermore, the disturbance depends upon the intensity of the illumination.

The more intense the lateral glare and the weaker the illumination of the centrally situated object, the greater the disturbance. In conclusion, Uththoff presents a case from his practice which will serve as a model for such experimental investigations.

Discussion : SCHMIDT-RIMPLER : Pathological cases had caused him to have constructed protecting glasses for cutting off lateral glare. These were made by Rodenstock, in Munich.

ZWAARDEMAKER and LANS : On refractory phases in ocular reflexes.

Prof. Zwaardemaker reported on some experiments made in the physiological institute in conjunction with Dr. Lans. He limited his paper to the subcortical winking reflexes, *i. e.*, those due to stimulation by light or to excitation of the 5th nerve. In man, these reflex actions are generally bilateral ; in the rabbit,

with some limitations, unilateral. He divides the entire reflex process into four phases :

1. A latency measured as reflex time.
2. An active closure of the upper lid.
3. A passive opening of the palpebral fissure.
4. A refractory phase.

The last is the subject of his paper. The duration of the first three phases is respectively 0.1, 0.2, and 0.1 second ; the newly described phase lasts a varying time, at first about 0.1 second, and later a longer time. It cannot depend upon fatigue, since it can be produced by very slight excitation.

The duration of the whole period is learned by determining the critical interval, that is, the length of time between two equal excitations in which the second reflex fails, while the slightest lengthening of the time allows the second reflex to appear. An interval less than 0.5 seconds almost never permitted a second reflex to appear, while an interval longer than 1 second almost always did so.

SILEX : Pseudomonochromasia.

Silex reported on a man of forty-five whose eyes, apart from the color sense, had no abnormalities. He complained only of the fact that with diminished illumination his vision was poor. His light sense, as measured with Förster's photometer, was normal. Colors appeared to him different in luminosity only, not in hue. "Nature seemed to him as colorless as a photograph." The Holmgren yarns were as little understood as the other methods of testing the color sense that are commonly used. The colored stripes of the spectrum appeared to him as a series of grays of varying luminosity. Practically, the patient seemed to be totally color-blind. When examined with the color-mixing apparatus of Koenig-Helmholtz, it was found that he did not perceive colors, and that, furthermore, he could compare spectral colors only when they were of similar luminosity. But when adjacent fields contained colors from the opposite ends of the spectrum, *e. g.*, red and blue, a slight difference was perceived even when the colors were of equal luminosity. This observation proved that he had a certain amount of color perception. The case, therefore, was not one of entire absence of color perception, but one of apparent absence.

OSTWALT : Experimental researches on periscopic glasses.

In his previous papers on periscopic glasses, Ostwalt had shown by mathematical demonstration that the slightly curved concave meniscus had a periscopic effect, while the convex meniscus required a much greater curving in order to have an equal periscopic effect.

The author has now attempted to control these theoretical results by experimental means. The same test card was photographed, while there were placed in succession before the objective a biconcave lens -4 D; and the meniscus lenses, $+2$ -6 ; $+4$ -8 ; $+6$ -10 ; $+8$ -12 ; and $+10$ -14 . Similar convex meniscus lenses also were used. After photographs had been made with the lenses centred, they were shifted 25° to the right or left, on a perpendicular axis extending back 30 mm from the anterior surface of the lens, thus approximating the relations when the eye, looking through a glass, turns 25° to the right or left. In this new position other photographs of the test card were made. Negatives so obtained were enlarged 4-5 times, and positives printed.

It appeared that the sharpness of the image obtained with a decentred lens was about $\frac{1}{16}$ that of the image obtained with a centred lens. The sharpness was $\frac{1}{2}$ in the case of the three least curved concave meniscus lenses. The usual convex meniscus of commerce, $+5$ -1 , gave a sharpness barely $\frac{1}{16}$ that of the centred lens. Only one convex meniscus, $+8$ -4 , which is very greatly curved, produced a fairly sharp image when decentred.

COPPEZ: The treatment of granular conjunctivitis by electrolysis combined with sublimate and jequirity.

The method which Coppez has employed for the past three years is as follows:

1. Electrolysis of the conjunctival sac. This is done under chloroform narcosis. The negative electrode is placed upon the granulations. A small de Wecker fork of steel serves as the electrode. A current of 4-5 MA. is used. The conjunctiva is scratched superficially, the points of the fork being entered deep only where the granulations are large. The resulting foam and the blood are washed off with sublimate 1:4000. Pain is severe during the operation, but there is not much afterward.

2. Touching the conjunctiva with sublimate 1:4000. A pledget of cotton wrapped about a glass rod and dipped in a sublimate solution is passed 20-30 times over the conjunctiva until slight

hemorrhage is produced. This application is made daily, and is not painful.

3. Pencilling the conjunctiva with a maceration of jequirity 1 : 20. The latter remedy is used mostly in cases of pannus. The application is made but once, three or four days after the electrolysis. The cornea often clears up in an astonishing way.

The course of treatment lasts from three to six weeks. Coppez has treated over 350 patients according to his method, and is satisfied with the almost constant success obtained.

DRUAULT : On the colored rings one sees about a flame, in normal and pathological conditions.

A portion of this paper is taken up with a theoretical study of the relations which exist between the size of the colored ring and the size of the elements producing it. These relations permit us, in particular cases, to determine the place of origin of a ring that is capable of being measured. The remainder of the paper is a clinical and experimental study of the colored rings seen about a flame.

There are many rings of this sort, but the author has studied three only, namely, the colored ring of glaucoma and two rings that are physiological.

One of the physiological rings is produced by the fibrillary structure of the lens. Some persons see this in normal conditions ; others only when the pupil is dilated. In general, the instillation of a drop of cocaine is sufficient to bring it to view. After instillation of atropine its appearance may suggest glaucoma. In such cases, if the pupil is gradually covered with a screen the colored ring will vanish towards two opposite points as soon as more than half of the pupil is cut off, thus being distinguished from the colored rings of glaucoma. The apparent diameter of this ring is, for yellow, about 6° .

The second ring studied is smaller, being about 4° in diameter. Various authors who have called attention to this ring consider the anterior surface of the cornea as its place of origin. Although it is difficult to determine accurately the location of the elements which give rise to this ring, the following experiment gives some clue to it. When one looks at a light through a cornea lying in water, a colored ring is seen having a diameter of about 4° . This ring is produced by the endothelium on the posterior surface of the cornea, for if this is scraped off the ring vanishes. When, however, the anterior epithelium has been removed with a sharp spoon, the ring remains.

The colored rings in glaucoma are generally thought to be due to a cloudiness of the deep layers of the corneal epithelium. Donders and others have thought it similar to the lens ring. But the glaucoma ring has a diameter of 8° and, unlike the lens ring, does not disappear toward two opposite points when the pupil is gradually covered. Furthermore it may be shown that the size of the elements which produce the glaucoma ring correspond fairly well in size to elements of the deep layers of the corneal epithelium.

The author further touches briefly upon the colored rings observed on awaking in the morning, in conjunctivitis, and after the action of water or the fumes of osmic acid upon the cornea.

HEINE : The anatomy of the myopic crescent. (Presented by Prof. Hess.)

Heine's preparations show that the characteristic distortions at the disc are caused by the different resistance of the three coats of the eye to the distending forces. Since the elastic elements of the choroid yield less readily than the retina and sclera, the elastic lamina of the choroid in its "relative retraction" draws a wedge-shaped fold of optic-nerve fibres in between retina and sclera. If the choroid atrophies in the region of the "relative retraction," a temporal conus develops.

COPPEZ : The action of certain toxins on the cornea.

The author endeavored to solve the following problems : 1. By what means can the toxins developed in the conjunctiva act upon the cornea ?

In answering this question the author proceeds from the clinical picture of diphtheria of the conjunctiva. In this disease one portion of the toxins formed passes into the general circulation, and another portion mingles with the tears and thus flows over the bulbar conjunctiva and cornea. The conjunctiva absorbs but little of the toxins while it is itself inflamed, because a condition of inflammation always hinders absorption, and toxins, on account of the great volume of their molecules, pass with difficulty through animal membranes. Thus the diphtheria toxin has its effect chiefly upon the anterior surface of the cornea. The epithelium, indeed, offers a resistance to the entrance of the toxin, but as soon as the integrity of this is disturbed in the slightest degree the cornea will become affected. Everything that leads to a lesion of the anterior surface of the cornea leads to an increase in the disease. Lesions of the epithelium may be caused

by our therapeutic measures, or by the rubbing of pseudo-membranes ; moreover, they may be the results of an affection already existing, or, finally, they may be due to the direct action of the toxin, which after forty-eight hours may lead to loosening of the epithelium.

Contrary to the views of Gosetti and Jona, Coppez concludes from his investigations that the tears have no anti-toxic effect on the toxin of diphtheria.

2. What is the action peculiar to each toxin ?

(a) The toxin of diphtheria has a very marked effect on the cornea, as was shown in the author's papers published in 1897.

(b) Abrin instilled into the conjunctival sac leads to opacity and necrosis of the cornea. The use of jequirity in cases of trachomatous pannus proves that abrin does not act on the cornea by checking the current of blood in the circumcorneal vessels ; this toxin has rather a vaso-dilator effect.

(c) The toxin of the streptococcus has but little effect upon the cornea. Coppez believes that most of the symptoms attributed to this toxin by Bardelli did not depend upon the toxin itself, but upon the bouillon used, the dead cocci, and the substances added to the bouillon to kill the cocci.

(d) The toxin of the pneumococcus also has but little effect upon the cornea, which is not due alone to a particular resistance of the corneal epithelium to this toxin, as Druault and Petit believe, but rather to the lesser energy possessed by this toxin.

(e) The toxins of the staphylococci, studied by Salowiew and Molodorosky, were believed to produce the same lesions as the cocci themselves. But in how far other factors should have been taken into account, such as the bouillon and the like, must remain to be decided by future investigations.

BALL, J. M. : Excision of the superior cervical ganglion of the sympathetic in two cases of glaucoma and one of atrophy of the optic nerves.

CASE I. The patient, a man of thirty-six, had suffered for two months with very painful inflammatory glaucoma in the right eye. R. V = p.l. ; L. V = $\frac{2}{4}$; R. T + 3 ; marked excavation of the disc. Excision of the superior cervical ganglion May 15, 1899. Immediate disappearance of the pain ; T + 2 after the operation, and + 1 three days later. July 23d, fingers could be counted at five feet and the ophthalmoscopic examination revealed a more marked filling of the retinal arteries and a better color in the disc.

CASE 2. The patient, a woman of forty-three, had suffered for two years with simple chronic glaucoma with excavation of the discs. R. V = 0; L. V = p. l.; T + 3 in both. June 15th, excision of the left superior cervical ganglion. Two days later L. V = fingers at two and a half feet, eight days later fingers at four feet, the tension diminished on the 16th day. In the meantime the perception of light had returned in the right eye. July 1st, the right upper cervical ganglion was excised; July 23d, R. V = fingers at four inches, T + 1; L. V = fingers at seven feet, T + 3.

CASE 3. The patient, a man of forty-six, complained of gradual failure of vision and for weeks he had been practically blind. R. V = p. l. L. V = 0. No history of alcoholism or syphilis. As a last resort, excision of the right superior cervical ganglion was performed, but as yet it has been of no benefit.

Another case of optic-nerve atrophy in which the same operation was done is still under observation.

In simple glaucoma, excision of the ganglion caused an increased flow of blood to the orbit, an increase in vision, and a diminution in the intraocular tension.

The microscopic examination of the excised ganglion always revealed practically identical changes, viz., a hyperplasia of the connective tissue which partly divided up the ganglion into several portions containing nervous elements. In general the process was a sclerosis arising from an inflammation in the neighborhood of the vessels.

The author comes to the following conclusions :

1. Excision of the sympathetic ganglion is a useful operation in simple glaucoma.
2. In acute glaucoma, when iridectomy fails, this operation may be tried.
3. In absolute glaucoma with severe pain the operation should be tried before enucleation is resorted to.
4. The excision of the superior cervical ganglion as well as that of the middle is, if performed *lege artis*, an innocent operation; excision of the inferior ganglion is of greater difficulty and more dangerous.

GUTTMANN, G. **On the treatment of complicated cataract.**

This paper was a continuation of Arnold's report published in these ARCHIVES in 1892 in regard to the results of operation on

complicated cataracts in Haab's clinic. In the past eleven years forty-three eyes with complicated cataract have been treated. The complications comprised excessive myopia with chorioretinitis circumpapillaris et centralis atrophicans, fluidity of the vitreous, detachment of the retina, posterior synechiæ in cases of shrunken cataract, tremulous cataracta cretacea with secondary glaucoma, iridochoroiditis with cataracta polaris anterior and posterior, the results of sympathetic ophthalmia, progressive lamellar cataract, extensive retinitis centralis senilis with congenital amblyopia, scleritis, disseminate choroiditis, and retinitis pigmentosa. In thirty-two of these cases vision was improved by operation to a degree between the limits $V = 1$ and $V > \frac{1}{1\frac{1}{2}}$; in six cases vision was not improved; and in five cases it was made worse. Five cases of particular interest were reported in brief. In one case with detachment of the retina and excessive myopia, an extraction of a ripened cataract without loss of vitreous gave the patient $V = \frac{3}{6}$. In a patient with exclusion of the pupil, coloboma upward and downward from operation, and loss of vision for thirty years, extraction of his nuclear cataract in its capsule without loss of vitreous gave him $V = \frac{1}{3}$. In a patient with retinitis pigmentosa and extensive rosette-formed posterior polar cataract, discission and subsequent linear extraction improved vision from $\frac{1}{20}$ to $\frac{1}{4}$. Another patient with retinitis pigmentosa and an extensive posterior polar cataract was rendered capable of working. The acuteness of vision was improved from $\frac{1}{6}$ for distance to $\frac{1}{4}$, and from Sn. 12 for near to Sn. 2, by discission and extraction. Finally, a patient of thirty-eight with disseminate choroiditis, retinitic atrophy of the optic nerves, and anterior and posterior polar cataract, who had not been able to go about alone, after extraction in both eyes had $V = \frac{1}{1\frac{1}{2}}$ in one and $\frac{1}{1\frac{1}{2}}$ in the other.

The prognosis of complicated cataract, providing careful aseptic and antiseptic precautions are taken, is not so unfavorable as many believe, and such unfortunates sometimes obtain better vision than one would expect when the nature of the underlying disease is considered.

KNAPP. On some rare tumors of the orbit. (Five cases.)

I. *Three lipomas*, two in the upper and one in the lower portion of the orbit: the first two, circumscribed, removed through the conjunctiva; the third, diffuse, removed through the skin. Excessive exophthalmus, marked disfiguration, eye blind from

atrophy of the optic nerve. After operation patient free from annoyance, and the disfigurement for the most part corrected.

II. *Two large serous cysts.* Exophthalmus, blindness. After a lateral cyst was evacuated and removed a second cyst was discovered behind the eye. It also was evacuated and removed with the orbital fat. The contents were watery. Axenfeld, who examined the preparation, pronounced it a lymph cyst. Smooth healing.

III. *Ossifying large-spindlecelled sarcoma in the depth of the orbit,* separated from the inner wall of the orbit by a layer of connective tissue but adherent outwardly to the internal rectus muscle. Papillitis. Extirpation. Smooth healing. Eye regained its proper position; $V = \frac{2}{3}$. The encapsulated hard tumor, which felt like a fibroma, proved to be a large-spindlecelled sarcoma with osteoid foci.

IV. *A large dermoid cyst* in the inner-upper portion of the orbit, soft, fluctuating. Papillitis. V and T N. A paracentesis allowed the escape of considerable pus, but a fleshy mass remained. Recurrence. Extirpation two months after the first operation. The capsule, filled with pus and an atheromatous mass, removed entire. Complete recovery. The microscope shows the inner surface of the capsule to be lined with proliferating and partially degenerated epithelium. Only eighty-four of these congenital cysts have been reported.

V. *Encapsulated small-spindlecelled sarcoma* in the inner-upper portion of the orbit erroneously taken to be a cyst. It formed a bluish projection under the conjunctiva and when punctured much viscid liquid escaped. Extirpation without rupturing the capsule, through the skin of the upper lid. Healing good. Microscopically a pure small-spindlecelled sarcoma. The speaker remarked that the most frequent tumor of the orbit was sarcoma, and this fact must always be borne in mind even when in a given case another diagnosis seems more proper.

FOURTH DAY, FRIDAY, AUGUST 18TH.

GENERAL SESSION.

REYMOND: The surgical connection of the lesser faults of curvature in the optical portion of the cornea.

The author first discussed the investigations that had been made to discover the effect on corneal curvature of an increase or

diminution in intraocular tension. He passed then to the relations existing between the results of these investigations and the resistance to increased tension shown by ophthalmometric examination. The changes which the optical portion of the cornea undergoes in various affections of the cornea and the ocular coats, prove, like the experimental investigations, that lessened resistance of the basal portion of the cornea and the limbus can modify the degree of curvature of the central optical portion of the cornea without altering the physiological type.

The author then took up the changes in corneal curvature observed after cataract operation and discussed in detail the well-known attempts at an operative correction of astigmatism by means of perforating or non-perforating wounds of the cornea, limbus, or sclera. In conclusion, the author stated that no positive rules for the operative treatment of astigmatism could be drawn up, because not only have we no means of increasing or decreasing the resistance of any particular portion of the cornea, but there is no possibility of regulating the degree in which the resistance should be increased or diminished.

KNAPP: On the symmetry of our eyes and a uniform designation of the meridians, based upon it.

The author stated that it was one of the duties of the International Congresses to decide upon units of measure, value, and strength, and to unite upon uniform designations to be applied to the results of investigation. The ophthalmologist must determine every day the angles of the principal meridians of eyes, note them in his records and reports, and send them to the optician who grinds the correcting lenses. At present this is done in various ways. The meridians of the eye, and particularly of the cornea, are, regarded individually, asymmetrical curves, hence the astigmatism, but their relation in the two eyes to the median plane of the body or the vertical median plane of the eyes, which is parallel to the former plane, is in a high degree symmetrical. Our visual apparatus is a symmetrically arranged paired organ like our ears, hands, eyes, and others. In more than 80 per cent. of cases the meridians of the eyes are practically symmetrical; in the other cases they approximate symmetry, and only in a few cases are they asymmetrical, *i. e.*, that corresponding principal meridians are inclined to the nasal side in one eye and the temporal in the other.

The speaker referred to the tabulated results of the examination

of 2473 patients who were astigmatic in both eyes, as showing how constant was this law. As the most satisfactory method of designation, both scientifically and practically, he recommends that in which from the nasal end of the horizontal meridian, 0° , for both eyes the scale runs upward, the diagonal toward the nose being numbered 45° , the vertical 90° , the diagonal toward the temple 135° , and so on through the entire circle. In this way one obtains a regular, uniform, readily comprehensible designation for the meridians of astigmatism and of the visual field, according to the principle of symmetry. The limits of the visual fields of the two eyes form entirely symmetrical figures.

SESSION OF THE SECTION.

HEINE : Contracted and relaxed ciliary muscle (read by Professor Hess).

Heine has succeeded in fixing monkeys' eyes both in accommodation and at rest in warm Flemming's solution, thus rendering them suitable for microscopic study. Eyes in which eserine had been instilled showed the ciliary muscle lengthened anteriorly and inward—the hyperopic form. Eyes in which atropine had been instilled showed the myopic form of the muscle.

The system of Fontana's spaces is unfolded in the eye with eserine.

Further preparations of monkeys' eyes demonstrate the favorable effect of posterior sclerotomy on the relations of the chamber angle.

PFLUEGER : A new chart for determining color blindness.

Since blue-yellow blindness is so rare that in examinations it may usually be left out of account, Pflueger contents himself with a red chart on which is laid gray in thirty-six shades according to Hering.

PFLUEGER : On the determination of acuteness of vision for near in highly myopic eyes.

The author had photographically reduced his test card to $\frac{1}{16}$. The card is mounted on a stand and the far point can be accurately measured, and the acuteness of vision at every centimetre of distance computed.

GREEFF : The nature of Fuchs's atrophy of the optic nerve.

Fuchs made the discovery that in the periphery of the optic

nerve connective-tissue septa run concentric with the pial sheath. External to these septa no nerve fibres are found in the optic nerve, but only a fine network. Fuchs called this condition peripheral atrophy of the optic nerve. Greeff showed that this was not an atrophy but a physiological neuroglia sheath such as surrounds the entire central nervous system.

WEBER, A. : The operative treatment of astigmatism.

The author made many experiments in regard to the changes in corneal curvature following sections made with lances of various curvatures. He also measured the astigmatism following glaucoma and cataract operations. Sections made with the Graefe knife were not considered on account of the unavoidable irregularity in puncture and counterpuncture. Of 112 cases of glaucoma in which a lance 6-9 mm broad was used, it was found that in the meridian dividing the wound the refraction sank 0.5-2.5 D, while in the meridian at right angles it rose 0.5-3 D. On an average, the astigmatism produced was 2.76 D. For lance incisions of 10 mm (in cataract operations), a constant astigmatism of 1.75 remained; for an incision of 11 mm, 1.67; for 12 mm, 2.25, lasting for some weeks or months. It disappeared entirely in 24 % of the 10 mm sections and in 26 % of the 11 mm sections, but never in the 12 mm sections. When a flat-backed lance of 11 mm was used, the permanent astigmatism increased to 2.75 D. The location of the section is of great importance. Only after he had made these preparatory observations did Weber undertake operations for the correction of astigmatism. But the results of operation were so unsatisfactory that he now employs such procedures only in astigmatism of high degree when with the most careful correction vision is still poor.

SCHIECK, F. : The primary changes in ribbon-shaped keratitis.

Schieck described a fresh case of ribbon-shaped keratitis examined both clinically and microscopically. Contrary to the recent claims that the calcareous deposits in Bowman's membrane were secondary, following primary inflammatory processes in the superficial layers of the cornea, he found that in fact the deposition of chalk in Bowman's membrane was the first symptom of the ribbon-shaped corneal opacity, the calcification of the membrane being found in his case without any signs of inflammation in the neighborhood.

BOECKMANN : On trachomatous pannus and its treatment by peritomy.

The author proceeds from the view that trachomatous infection sets up in the subconjunctival tissues a chronic inflammatory condition, *i. e.*, a sort of tarsitis, episcleritis, etc., and that while the original affection of the conjunctiva can be improved and finally cured by proper treatment, the deeper inflammatory foci remain latent and resist every medicamentous treatment. Trachomatous pannus, he believes, is the result of chronic scleritis. One of the most rational means of combating it is peritomy, favorable reports of its use being heard from various quarters. The circumcorneal zone of invasion is destroyed by the peritomy and replaced by dense scar tissue extending into the cornea. This sound scar tissue forms a barrier to the extension of the trachomatous process; the pannus decreases gradually in density and slowly becomes absorbed.

The author's technic is as follows: a strip of conjunctiva 2-3 mm broad is removed about the entire circumference of the cornea, multiple scarification is then done in this exposed area until white healthy sclera is seen, and the wound is then left to close by granulation. The excision of the strip of conjunctiva alone will not cure the scleritis which brings about the pannus; an essential element of the operation is the scarification.

Usually the reaction after the operation is moderate, consisting in œdema of the lids, chemosis, and considerable secretion. The vascularization of the cornea at first increases, new arterial loops spreading over the cornea. The circumcorneal wound soon fills up with healthy granulations. The eye is washed out with 5% solution of protargol. In the course of the second week the wound cicatrizes and the pannus rapidly clears up. After a month the patient is discharged with instructions to use an antiseptic wash.

The results of peritomy are quicker the more radical the operation—a sure indication that the sclera is the actual seat of the disease. If one operation is not sufficient, a second or even a third may be made. The speaker has done this operation in thousands of cases over a period of twenty years and regards it as unattended with any dangers.

SCHOEN: The changes in the eye of the child that are produced by spasms.

The author endeavored to demonstrate anatomically the changes in the lens and retina that are brought about by spasm of the ciliary muscle and lead to lamellar cataract. These changes he

states consist essentially in vacuolation of the cells of the retina and the fibre cells of the lens.

ROGMAN : On pseudo-accommodation in aphakia.

Rogman in his investigations has not used ordinary cataract patients, but patients from whom the lens had been removed for high myopia. By this means many sources of error are eliminated. He began by determining the refraction by retinoscopy, then obtained the acuteness of vision for distance, then tried reading tests with Snellen's types and noted the distance at which they could be read. During the examination the lids were held apart either with the fingers or a lid elevator. Persons examined in this way showed a pseudo-accommodation of 2-5. D, with the limitation that at the near point the acuteness of vision was less than at the far point.

According to the author, the pseudo-accommodation is to be explained through the so-called neutralization of the diffusion circles or more likely through the physiological irregular astigmatism, *i. e.*, the physiological polyopia (Salzmann).

The author then calls attention to a number of practical points. Besides the actual pseudo-accommodation which the aphakic eye possesses, we are not to forget the artificial pseudo-accommodation which depends upon the patient's holding the glasses nearer to or farther from the eye, or looking obliquely through the margin of the glass. The patient's attention should be directed to the latter points. In order to keep the diffusion circles as small as possible, the operation for cataract should be done without iridectomy when possible, thus favoring pseudo-accommodation. Pseudo-accommodation is to be taken into account in operations for myopia also.

TREACHER COLLINS : Anatomy and congenital defects of the ligamentum pectinatum.

The author studied the relations of the chamber angle in various animals and in a number of human embryos. Besides this material he had at his disposal several cases of microphthalmus and congenital glaucoma. His conclusions were as follows :

1. In almost all mammals the ligamentum pectinatum is more highly developed than in man. In these animals it consists of an outer lamellar zone with interstitial spaces, and of a cavernous zone with large, irregular cavities. The human eye has no cavernous zone, both zones being combined into one in the chamber angle.

The angle proper extends farther outward in man than in the lower animals.

2. The extent of the ligamentum pectinatum stands in a certain relation to the size of the cornea and eyeball. The decrease in volume in the cornea and eyeball in man is attended with a simplification of the structure of the ligamentum pectinatum and a displacement of the chamber angle outward.

3. In the development of the human eye various stages are to be observed, in which can be noticed the relations between the development of the iris angle and the relative size of the cornea. These various stages of development are exactly identical with those observed in animals.

4. In the human eye that has been retarded in its development one finds the same relations of the ligamentum pectinatum as in animals.

5. In eyes with congenital increased tension and stretching of the tissues the ligamentum pectinatum resembles that of the lower animals, having a cavernous zone.

From these observations the author concludes that the simplifying of the ligamentum pectinatum and the displacement of the chamber angle outward facilitates the outflow of the intraocular liquids, which is the more necessary the narrower the zone of the ligamentum pectinatum is in relation to the volume of the ball. In congenital anomalies of the ligamentum pectinatum the outflow of intraocular liquid is not hindered, and the tension remains normal only when microphthalmus exists. If the eye has its normal volume, there must be a disturbance in the outflow of intraocular liquid, with its results, viz., increased tension and stretching of the ocular walls.

DOR : On the treatment of detachment of the retina.

The author called attention to the fact that in 1893 he had reported a case of spontaneous recovery from detachment of the retina in both eyes, with resulting vision of 1 in one eye and $\frac{2}{3}$ in the other, after seven years' duration of the affection. Since then numerous cases of this sort have been reported, and 136 are now known, but compared with the frequency of detachment this percentage is very small. In the years 1887-1899 the author has seen fourteen complete recoveries in twenty-one cases treated in the following manner: subconjunctival injections of 20 % salt solution, applications of the Hourtelleuve, and punctate cauterizations of the sclera; each of these procedures being used once weekly in alternation.

In cases of detachment of the retina, one must not idly look on, but must treat the case, and the method employed by the author is quite free from danger, and is followed by undeniable results.

BIELSCHOWSKY : **On the vision of patients with squint.**

The author asked the following questions :

1. How does the squinting eye localize the impression received ?

2. What part does it play in the construction of the visual field ?

Besides the familiar methods, the after-images were used as suggested by Tschermak for determining the foveal line of vision of the squinting eye. While in a portion of the cases the normal correspondence of the retinas was preserved, both foveas projecting their impressions in the same general direction, in some cases there was an abnormal localization, the fovea of the squinting eye having a line of vision different from the other. The angle corresponding to the deviation from the normal corresponded more or less exactly to the angle of the squint, but in particular cases there was considerable departure from this condition. Frequently there was found, particularly in periodic squint, an apparently irregular alternation of normal and abnormal localization. In one case the simultaneous employment of the normal and abnormal localizations led to binocular triple vision or monocular diplopia.

In ordinary vision, as a rule, the images of the squinting eye are not regarded. Under certain conditions we may obtain typical double vision in cases with undisturbed correspondence ; in most of the other cases the visual field seems to be composed of portions seen unocularly but furnished by both eyes. In but few cases is there a common visual act, and this represents only a rudiment of the normal binocular visual act and differs fundamentally from the latter.

The prospects of therapeusis are quite independent of the rôle which the squinting eye plays in the visual act ; there is in all cases a possibility of obtaining binocular vision by proper treatment, provided that the amblyopia of the squinting eye does not render this out of the question.

KOSTER : **On the elasticity of the sclerotic, and its relation to the development of glaucoma.**

The determination of the elasticity of the sclera by means of excised strips of that membrane gives results which are not reliable. Accurate results may be obtained, however, by estimating

the increase in the contents of the eye when the intraocular tension is raised regularly.

DE LAPERSONNE: On optic neuritis in consequence of inflammations of the sphenoidal sinus and diseases of the posterior nasal cavities.

In a previous report the author called attention to the various symptoms on the part of the eye and the orbit that might arise in the course of inflammations of the sinus, and alluded to the fact that not rarely it was the eye symptoms which drew our attention to the affections of the sinus that are so often overlooked. Further experiences have enabled him to confirm all that he said at that time, but in the present paper he limits himself to the relations which exist between affections of the sphenoidal sinus and the higher portions of the nasal cavity, on the one hand, and certain symptoms on the part of the optic nerve, on the other hand.

According to Berger, to whom we are indebted chiefly for our knowledge of the surgery of the sphenoidal sinus, the most frequent ocular symptom due to inflammation of the sphenoidal sinus is a retrobulbar neuritis localized in the optic canal and at first not presenting any ophthalmoscopic changes. Other authors, such as Nieden and Panas, have observed choked disc, but both of these patients died of purulent meningitis and the cases are not convincing since there were at the same time extensive pathological changes on the floor of the skull.

In the three cases which the author records there was unilateral choked disc, which suggested the correct diagnosis and led to the discovery of extensive pathological changes in the sphenoid and the posterior ethmoidal cells. There were wanting the ordinary signs of disease of the sinuses, such as severe neuralgias, photophobia, lachrymation, blepharospasm, and erysipelas-like redness of the root of the nose.

Berger believes that certain forms of atrophy of the optic nerve which develop in the period of growth are to be referred to an irregular development of the sphenoidal sinus, leading to compression of the nerve in the optic canal. In a similar way, though more rapidly, the visual disturbances may arise from infectious processes in the ethmoid. Thus an acute neuritis or perineuritis may develop in the portion of the nerve that lies within the optic foramen, and manifest itself through a sudden amaurosis or a concentric contraction of the field. The ophthalmoscopic picture is normal at first, but later atrophy of the nerve is seen.

Without doubting that retrobulbar neuritis may develop in this way in the optic canal, I believe that the cases reported of choked disc fall rather into the category of infectious neuritis whose origin is not understood. Choked disc depends upon the conduction of the infection along the sheaths of the optic nerve, and not, as the Schmidt-Rimpler-Manz theory proposed, upon a stasis of liquids in the sheaths. If the neuritis is bilateral, the cause is certainly behind the chiasm; if unilateral, anterior to the chiasm.

In infectious processes in the orbit and in cases of orbital tumor, choked disc is not rare. Inflammation of the sphenoidal sinus is not a rare affection but one frequently overlooked. Rhinopharyngitis superior is also a very frequent and very obstinate affection, which under the influence of a fresh infection, such as influenza, measles, or even an acute coryza, can extend to the sphenoidal sinus. The involvement of this sinus may be manifested through the symptoms described by Berger and Kaplan, or these may be almost altogether wanting, or the symptoms that are present may be disregarded by physician and patient until complications on the part of the optic nerve excite suspicion.

In every case of unilateral choked disc, therefore, the sphenoid, the posterior ethmoidal cells, and the upper posterior portion of the nose are to be examined carefully, and this examination will often lead to the discovery of the point of origin of the infectious inflammation of the optic nerve.

The opening of the sphenoidal sinus by Zuckerkandl's method leads to recovery from the original affection but has no effect upon the optic nerve, which slowly goes on to atrophy.¹

MACKENZIE (London): The localization of foreign bodies in the eye by means of the X-rays.

Mackenzie hit upon the idea of photographing foreign bodies in the eye stereoscopically, thus making an estimation of depth possible and considerably facilitating localization. He demonstrated a series of Röntgen-ray photographs of foreign bodies in the orbit.

GOSSMAN: Localization of foreign bodies in the eye by X-rays.

Beginning with a case of perforating injury of the ciliary region in which the X-ray demonstrated the presence of a foreign body

¹ Holmes (these ARCHIVES, 1896, p. 460) reported a case of complete blindness in one eye with restoration of sight after opening the sphenoidal sinus.—*Trans.*

although the possibility of it was denied by the patient, the author has used a very simple method of localization.

He makes use of the movements of the eye for localization, the source of light remaining fixed on the other side of the patient. Two skiagraphs are made, one while the patient is looking up, and the other while he is looking down. Thus, if the foreign body is in the anterior portion of the ball, its image will have travelled downward in the second skiagraph, while if it is in the posterior portion of the ball, the image will have travelled upward. If in the lower half, the image will have travelled backward, and if in the upper half, forward. If the shadow remains fixed, the foreign body must lie near the centre of rotation of the eye. In such cases more skiagraphs are to be made, the eye being moved meanwhile in a horizontal plane.

NICOLAI : On the tension of the ocular tissues.

Nicolai showed that even the retina is stretched by the intraocular pressure. In eyes that had been punctured, the retina was found to be a fifth thicker than in others. The retina is, therefore, compressed by the intraocular pressure. The choroid when relieved of the intraocular pressure becomes twice as thick.

THORNER (Berlin) : A new fixed ophthalmoscope giving images free from reflexes.

Thorner's apparatus is undoubtedly the best demonstrating ophthalmoscope that we possess.

It shows the fundus magnified as in the erect image, and the field, with the pupil dilated, is four or five times as extensive as the field seen in the inverted image with the ordinary three-inch lens. Furthermore, the image is absolutely free from reflexes. This is obtained in the following way : The light coming from a lamp fixed on the apparatus passes through a semicircular opening the size of half the pupil. This light, by a complicated mechanism, is projected on one half of the pupil, while the other half of the pupil remains dark. Returning rays from the fundus pass through the unilluminated half of the pupil to the observer and no reflex is seen.

DOR, JR. : The projection of colored photographs.

Dor projected photographs of microscopical preparations in their natural colors. This was done according to the system of Lumière Brothers in Lyons, which is still in part kept secret. Yellow, red, and blue plates are made, the gelatin films are then removed and superimposed, and a positive prepared. Sections

stained with Biondi's tricolor stain showed the natural colors satisfactorily.

OLE BULL: Pathological changes in the retinal vessels.

Bull described the changes of the retinal vessels due to contusions and to syphilis, and presented colored drawings of these conditions.

Of nine cases that he observed after injury three were cured. This indicates that these were not eyes with previously existing vascular disease which the contusions had made worse, but that the trauma itself was the cause, for of forty-six non-traumatic cases only three recovered. Improvement occurred in both categories chiefly when there was narrowing of the vessels here and there. In syphilis the disturbances often lead to scotomas, so that an accurate perimetric examination often will lead to the discovery of vascular disease.

GRÓSZ (Budapest): Tabic atrophy of the optic nerves.

Grósz presented statistics as to the ocular symptoms and particularly the optic-nerve atrophy of two hundred tabic patients. In eighteen cases he was able to examine the optic nerves anatomically. His results correspond to the generally accepted views on the subject. In rare cases he found a central scotoma, but this he believes to have been due to a complicating toxic amblyopia. He believes that the primary lesion in tabic optic-nerve atrophy is in the ganglion cells of the retina.

GROSSMAN (Liverpool): Listing's law and its relations to paralyses of the ocular muscles.

As is well known, Listing's law shows that the eyes may be moved from the primary position to any other without movements of torsion. This is usually demonstrated by the relation of the after-images of vertical and horizontal lines. But since the statements of observers have varied so greatly in reference to the latter, Grossman has repeated the experiments on his own eyes and those of others, using a perimeter arc with a strip of celluloid to which was attached a colored strip that could be turned and shifted laterally. He found, in accordance with Hering's view, that no actual torsion occurred, although there was an apparent torsion from false projection when the image was projected on a plane surface instead of on the arc. The same was found in three cases of isolated paralysis of the ocular muscles. When these patients projected the images on the perimeter arc there

was no torsion perceptible, but the usual torsion appeared when they were projected on a flat surface.

LAVAGNE (Monaco): **The treatment of congenital nystagmus.**

Lavagne found that a girl aged ten with marked congenital nystagmus was much improved by wearing a diaphragm which improved the vision, and also prevented the pinching of the lids together from being of much service.

LANDOLT: **A reform in the designation of prismatic glasses.**

Landolt believes that prisms should be designated according to their deflecting power and not according to their angle. Since the deflection varies somewhat with different directions of the incident rays, he would designate the prism according to the angle of minimum deviation. Prisms numbered in this way are at once brought into relation with the deviation of the eye.

HOT (Christiania): **Ophthalmometric studies on the human eye after death.**

The author undertook a series of ophthalmometric measurements on eyes enucleated soon after death, the work being done in the laboratory of Javal and Tscherning. He found that no marked changes in curvature took place after death. The curvature of the posterior surface of the cornea also was measured. The cornea has the form of a concave meniscus. The cornea of the new-born does not differ much in curvature from that of the adult.

PFALZ warned against putting much confidence in determinations of astigmatism in dead eyes. BERRY called attention to the fact that very slight pressure could bring about changes in curvature.

SULZER: **On color perimetry.**

A color sensation may be produced by simple spectral light as well as by combinations of pigments.

Since pigments vary in composition, differ with different illuminations, and change in the course of time, they are not sufficiently exact for perimetry. Sulzer therefore uses colored glasses. He obtains a uniform intensity of color by using a diaphragm before the glass. The opening in the diaphragm is enlarged until the perception of color is just obtained. Then the diaphragm is opened a certain multiple of the size of the first opening. He finds that when such glasses are used the fields are the same for all colors.

A perimeter according to this principle has been constructed by M. Roulot (Giroux, successeur), rue de l'Odeon, Paris.

PFALZ (Düsseldorf) : **On perverse astigmatism.**

Pfalz examined 2574 eyes with uncomplicated errors of refraction sufficient to require correction, and made central and excentric corneal measurements with the ophthalmometer at various intervals of time up to four years. He comes to the following conclusions :

1. The cornea from youth on undergoes a constant change in curvature in the sense of a correction of its asymmetry. This asymmetry, pathological cases apart, is, up to the tenth year, an astigmatism according to the rule. The flattening is most evident in the vertical meridian, beginning at its periphery.

2. The lenticular astigmatism has, with increasing age, a greater part in the total astigmatism. Lenticular astigmatism, even the accommodative, is always against the rule.

3. A correction of corneal astigmatism against the rule by an opposing lenticular astigmatism never occurs.

4. After the sixtieth year astigmatism against the rule predominates. According to the author's figures it is present in 61.3% of all cases of astigmatism at this age.

Between 50 and 60 years the astigmatism against the rule is 38.8 %									
"	40	"	50	"	"	"	"	"	39.3 %
"	30	"	40	"	"	"	"	"	24.7 %
"	20	"	30	"	"	"	"	"	10.12 %

of all cases of astigmatism.

EXHIBITION.

There was an exhibition in the upper halls of the University in connection with the Congress. The historical department was of particular interest. Two large halls were filled with portraits, manuscripts, books, and medals of the two great Dutch oculists, Boerhaave and Donders. Besides these we saw an interesting reproduction of the papyrus Ebers, an ophthalmoscope used by v. Graefe, and instruments that had belonged to Anel.

In Kagenaar's room were the instruments with which Donders made his famous experiments ; and, among others, the pakeidoscope with which Pramen, in 1853, observed the changes in the form of the lens images in accommodation ; a corneal microscope devised by Donders and Mulder, that is also adapted for measuring the depth of the anterior chamber ; the phærophthalmotrope ;

the cycloscope of Donders and Küster ; the spectroscopic apparatus for effecting comparisons of color ; an instrument with a mouth-piece devised by Donders for autoöphthalmoscopy ; Donders's isoscope ; the horopteroscope, etc.

Snellen had his phakometer, the red and green optotypes with complementary-colored spectacles for discovering simulation, the color circle, and the apparatus for demonstrating the direction of rays of light in the eye.

Kagenaar had his astigmometer. Greeff exhibited colored plaster-of-Paris impressions of diseased conditions of the eye, and Thorner showed his demonstrating ophthalmoscope, which aroused considerable interest.

BOOK NOTICES.

I. Refraction and How to Refract, including sections on optics, retinoscopy, the fitting of spectacles, etc. By JAMES THORINGTON, A.M., M.D. A handy octavo-volume of 294 pages and an index, well printed on good paper with 200 illustrations, 13 of which in colors. P. Blakiston's Sons & Co., Philadelphia, 1900. Price, \$1.50.

The author, whose popular monograph on retinoscopy has just appeared in the third edition, has permitted his publisher to support the strength of his name by eight lines of titles, the first of which is: adjunct professor of ophthalmology in the Philadelphia Polyclinic; the last: resident physician and surgeon, Panama Railroad Co. at Colon (Aspinwall), Isthmus of Panama, 1882-1889, etc.

This book is an excellent guide in a course on the errors of accommodation, refraction, and motility of the eye. It is complete and altogether practical, presupposing only a minimum of knowledge, and supplying all that is necessary in order to learn and master intelligently this large and most important department of ophthalmology. Chapter i.—the optical introduction, 49 pages—gives a clear description, with many illustrations, of the indispensable physical foundation of the physiological refraction of the eye, which is treated of in chapter ii., 42 pages: acuteness of vision, mechanism and amplitude of accommodation, etc. Chapter iii., methods of ophthalmoscopy. The following chapters are on emmetropia, hyperopia, myopia, astigmatism and its tests, retinoscopy, muscles, asthenopia, and examination of asthenopia and its causes. Then follow, in the manner of a drill course, chapters ix.-xii.: how to estimate refractive errors, giving practical examples of the variety of cases, and explanations and instructions as to the different kinds and frames of spectacles and eyeglasses and how they should be fitted.

H. K.

II. A Manual of the Diagnosis and Treatment of the Diseases of the Eye.—By EDWARD JACKSON, emeritus professor of ophthalmology in the Philadelphia Polyclinic, etc. Philadelphia: W. B. Saunders, 1900. Price, \$2.50.

This book (a small-octavo volume of 604 pages, with 178 illustrations and 2 colored plates) "is intended"—the preface announces—"to meet the needs of the general practitioner of medicine and the beginner in ophthalmology." Without offering, so far as the reviewer can see, any particular features, it sustains the reputation of the author as being a well-educated, clear-headed, and industrious worker.

The apportionment and distribution of the subject-matter are happy, and the limitation and condensation of the exposition highly commendable. The selected bibliographies at the end of the different chapters will be appreciated by those that want to seek further information. The volume preserves a just medium between the unattractive compendium of the undergraduate and the elaborate treatise of the specialist. It will find its recognition and make its way as a true text-book. H. K.

MISCELLANEOUS NOTES.

ANNOUNCEMENTS.

The XIIIth International Medical Congress will be held in Paris, August 2-9, 1900. All doctors of medicine are entitled to membership by making the proper application and paying \$5. The American National Committee consists of Dr. WM. OSLER, of Baltimore, as president, and for the several associations their respective presidents,—for ophthalmology, Dr. F. O. WADSWORTH, of Boston. The general president of the section on ophthalmology is Professor PANAS of Paris; secretary, Dr. PARENT, Paris. There will be *three subjects for general discussion*, viz.:

1. Toxic and infectious optic neuritis, introduced by Bellarmino, Nuel, and Uhthoff.
2. The cortical centre of vision, by Bernheimer, Angelucci, and Henschen.
3. Enucleation and the operations to replace it, by Pflüger, Snellen, Swanzy, and De Schweinitz.

The N. Y. Eye and Ear Infirmary is to be enlarged by the addition of a pavilion for contagious diseases.

The *Annals of Ophthalmology* and the *Annali di Ottalmologia* have agreed on the simultaneous publication of selected articles in both journals.

Contents of the last number of the Archiv für Augenh.,

No. 2. Issued Nov., 1899.

8. H. SCHULTZ, Berlin. The older and newer mydriatica, miotica, and anæsthetica in ophthalmology.

9. J. W. H. EYRE, London. Tuberculosis of the conjunctiva. Translation of the English original. The latter, with 2 plates, appears in this number.

10. ST. BERNHEIMER, Vienna. The anatomical démonstration of the uncrossed optic fibres in man.

11. L. HEINE, Breslau. Further contributions to the anatomy of myopic eyes.

12. H. KNAPP. On the injection of a chloride of sodium solution into collapsed eyes (author's translation from these ARCHIVES).

13. W. T. LISTER. Report of the proceedings of the ophthalmic section of the British Medical Association, Portsmouth, August, 1899.

14. R. GREEFF. Conclusion of the proceedings of the IXth International Ophthalmological Congress at Utrecht, August, 1899 (translated in this number).

15. Conclusion of the systematic report on ophthalmology in the second quarter of the year 1899 (translated in our No. 6 of last year).

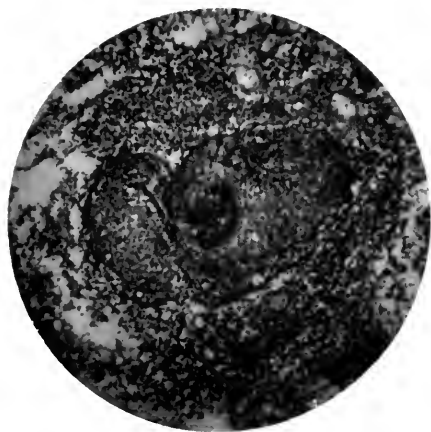


Fig. 1

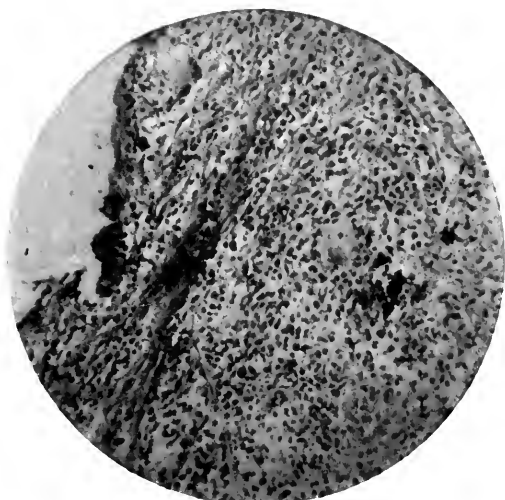


Fig. 2.



Fig. 3.



Fig. 4.

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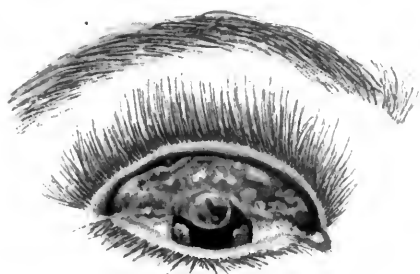


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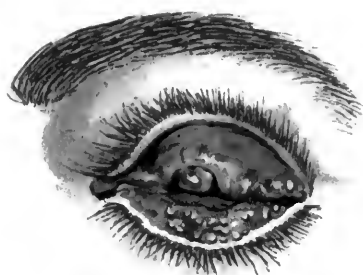


Fig. 6.

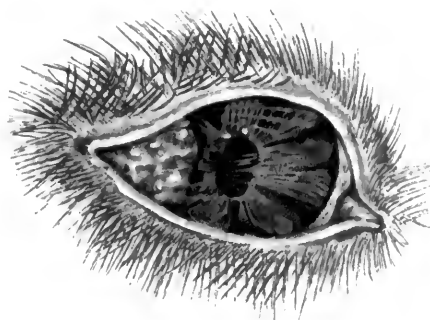


Fig. 7.

Fig. 3.



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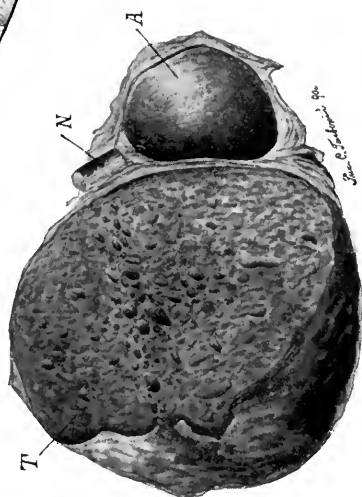


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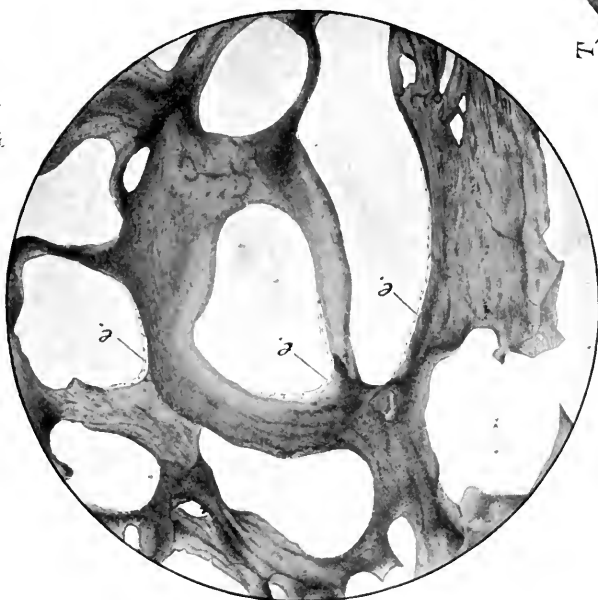




Fig. 1. (Hartnack Syst. 1 Ocul. 3.)

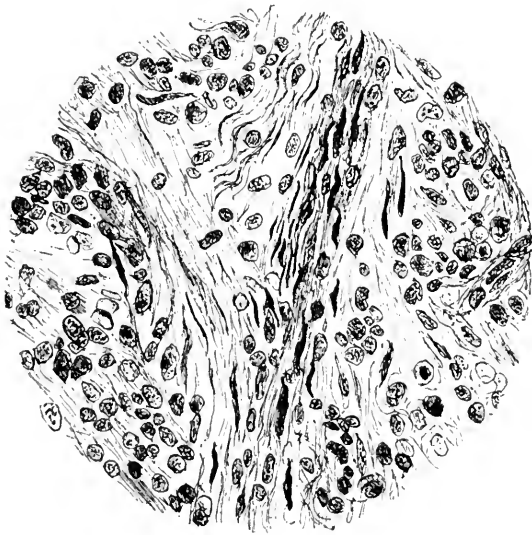


Fig. 2. (Leitz Syst. 7 Ocul. 3.)

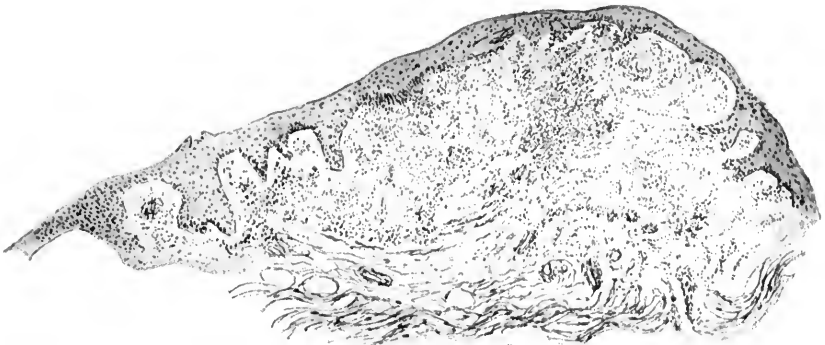


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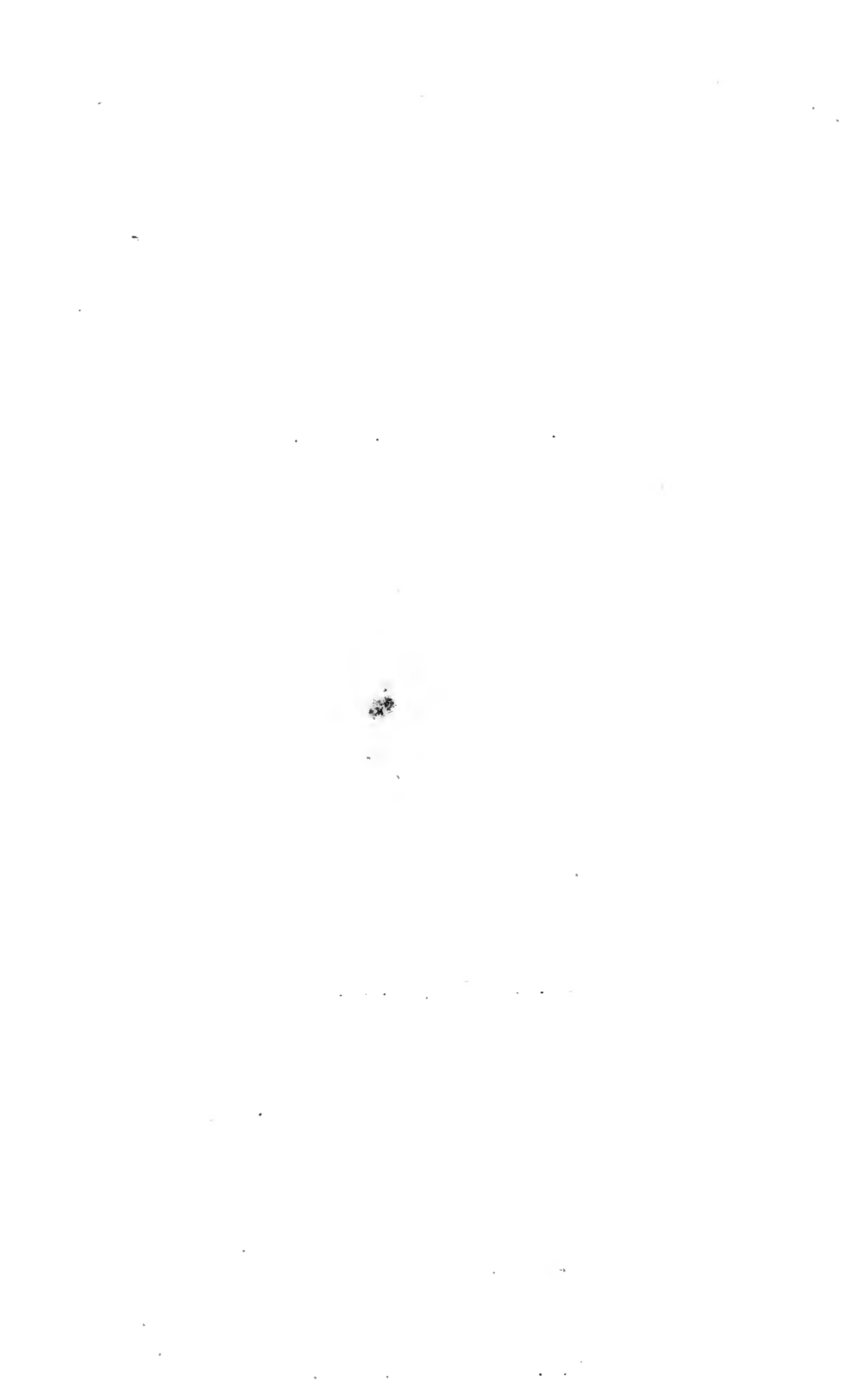




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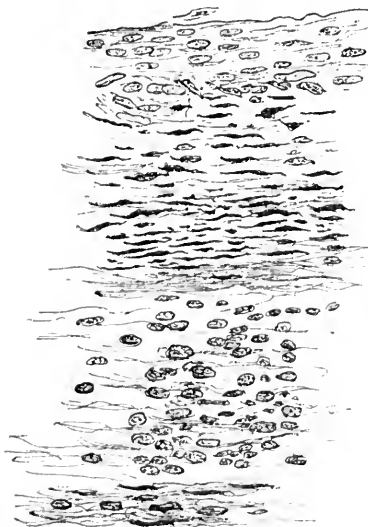


Fig. 5. (Leitz Syst. 7 Ocul. 3.)

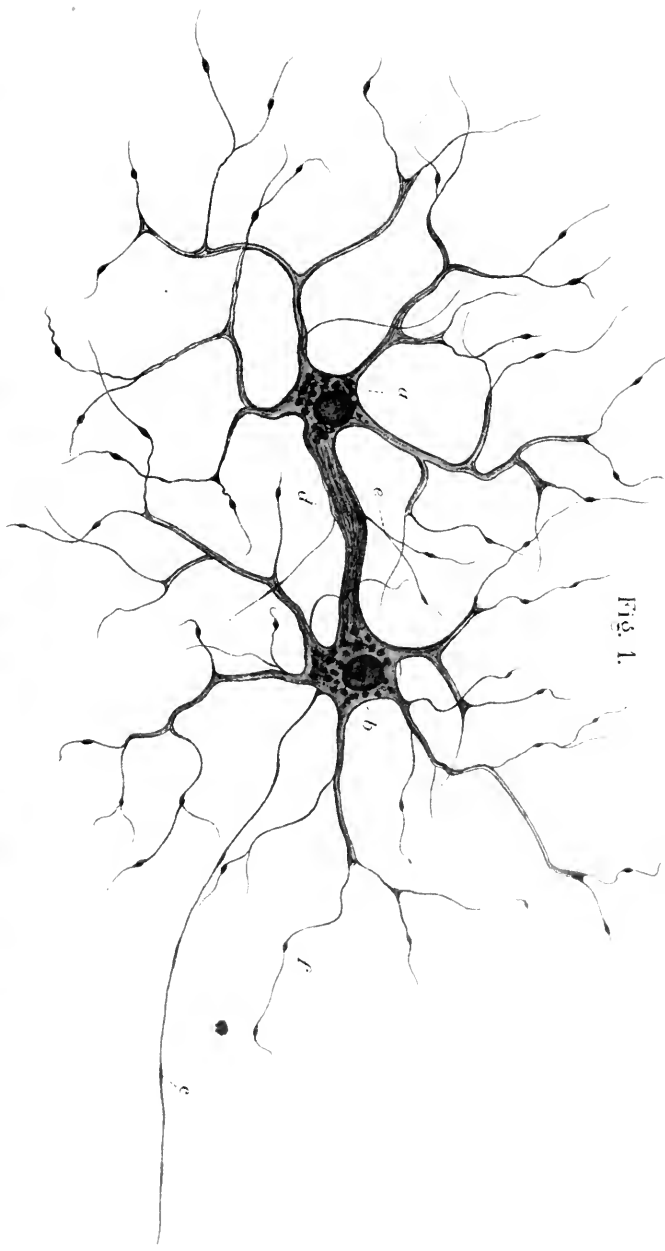


Fig. 1.

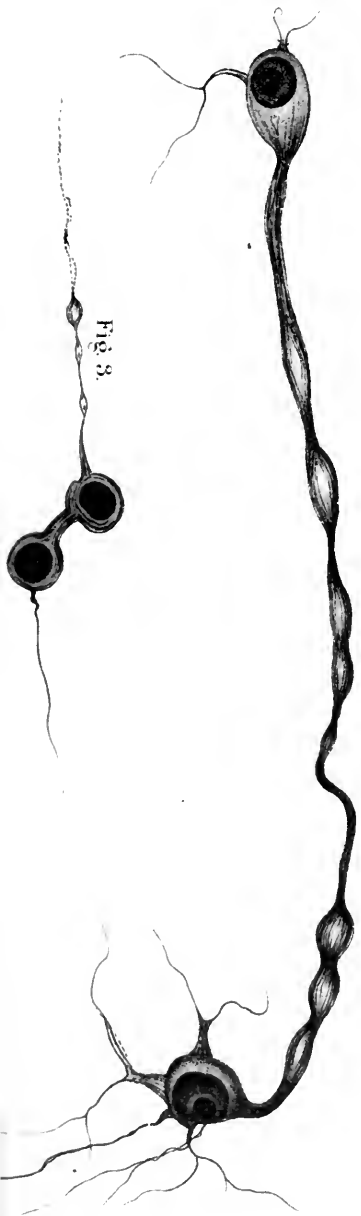
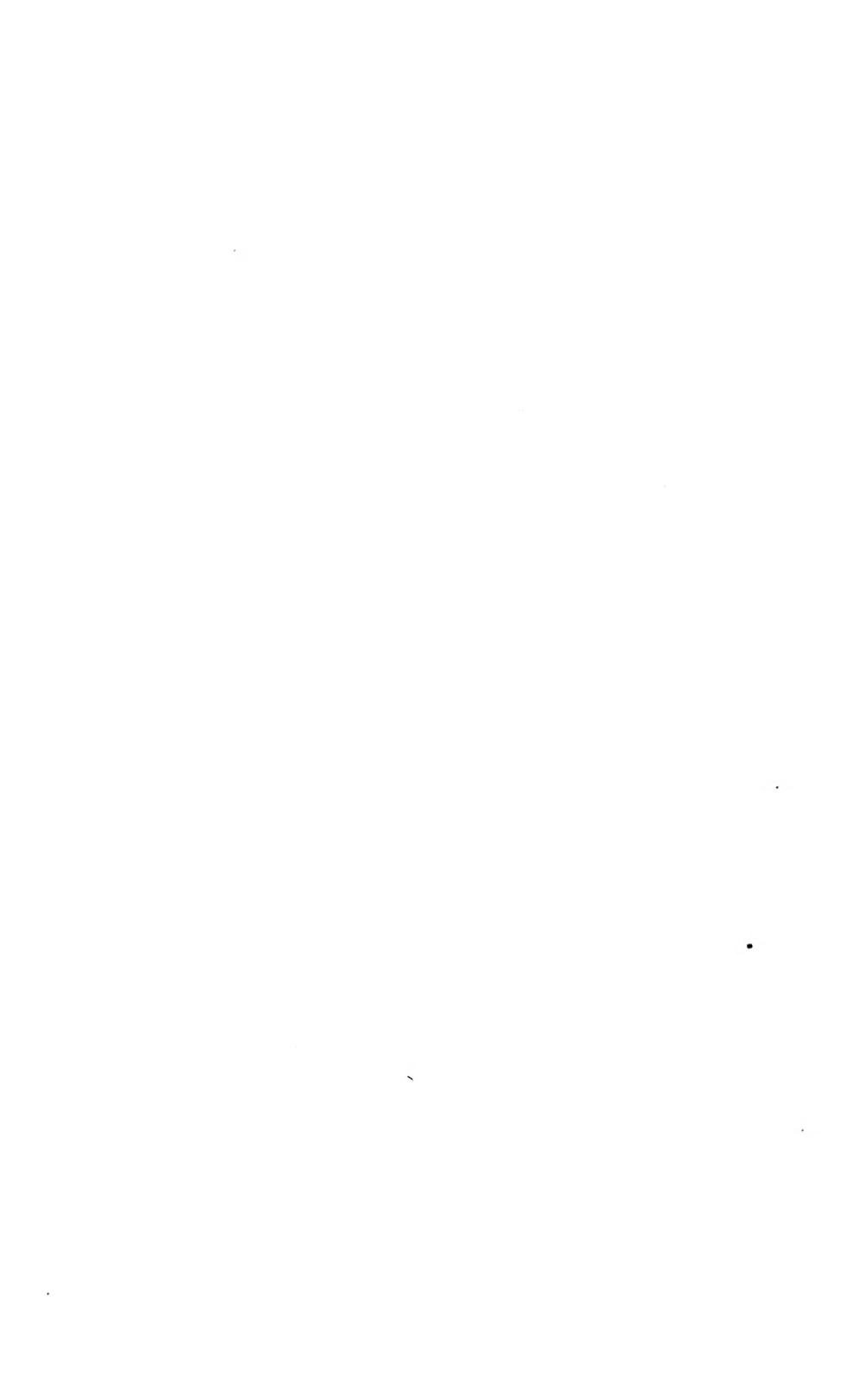


Fig. 2.



Fig. 3.



ARCHIVES OF OPHTHALMOLOGY.

REPORT OF A CASE OF ORBITAL CAVERNOMA REMOVED BY KRÖNLEIN'S METHOD, WITH PRESERVATION OF THE EYEBALL.

BY DR. ARNOLD H. KNAPP, NEW YORK.

Mrs. A. R., thirty-four years of age, noticed a protrusion of the right eye six or seven years ago. The exophthalmos has increased gradually, and was accompanied by failure of sight during the last two years. General health has always been good.

On **examination** the right eye appeared to be pushed straight forward. The exophthalmos measured about 12 mm. Motility of the eye was slightly restricted in all directions, especially upward. Palpation within the bony margin of the orbit was negative; any manipulation caused a luxation of the eyeball. V = $\frac{4}{200}$. Field normal. The ophthalmoscope showed a pronounced papillitis (elevation of the disc measured 5D). The nose and accessory cavities were normal.

Clinical Diagnosis: *Orbital tumor situated within the muscular cone, not directly involving the optic-nerve structures.* The patient consented to the operation with the understanding that the eye should be removed if found necessary.

Operation: August 1, 1899. Ether. A slightly curved vertical incision was made along the outer bony margin of the orbit, dividing the periosteum. The periosteum lining the inner side of the lateral wall of the orbit was retracted, together with the soft orbital contents, and the inferior orbital fissure localized. From the anterior end of this fissure the bony wall of the orbit was cut through with a chisel along two diverging lines: the one passing up and out to the external angular process of the frontal bone, practically in the suture between the great wing of the sphenoid and the malar bone; the other in a horizontal plane passing out and forward, appearing on the external surface of the malar bone, in a line directly above the insertion of the zygomatic arch. This wedge-

shaped piece of bone, with its muscular and cutaneous attachments, was strongly forced backward, giving free access to the orbit. The periosteum was incised in a horizontal direction. Palpation revealed a firm round tumor situated behind the eyeball. The soft parts were divided below the external rectus down to the tumor. The tumor could then be freed from its attachments by the finger, and shelled out. The hemorrhage was very slight. Careful palpation of the walls and apex of the orbit and of the optic-nerve structures revealed no abnormality. The eyeball was pushed back, the osteoplastic flap replaced, and the wound closed with deep and superficial sutures.

Beyond a slight swelling of the right half of the face, the subsequent course was undisturbed and afebrile. The wound healed by primary union; the bone flap had remained in place, and the patient was discharged on the tenth day.

August 17th.—No deformity except cicatrix in skin. V with $+4.5 = \frac{2}{3}\%$. Pupil moderately dilated. Diplopia at limit of outer and of upper fields. Swelling of optic disc has gone down except below. Eye in normal position. Sensation normal.

November 12th.—V with $+4 = \frac{2}{3}\%$. Otherwise as before.

February 19, 1900.—V with $+4 = \frac{2}{3}\%$. Disc shows no swelling but slight choroidal atrophy below. Paresis of ext. rectus as before, causing diplopia on looking to right at about 60° from primary position. Abduction to the canthus. Diplopia also in extreme upper part of field of fixation. The diplopia has not increased, and is not troublesome. Pupil normal. No deformity whatever.

The **tumor** is smooth, oval, semisolid, bluish red, and measures 22 by 30 mm. Microscopically it presents the picture of cavernous tissue surrounded by a thin capsule. The open spaces are filled with blood cells and lined with endothelium.

Anatomical Diagnosis : *Cavernous angioma.*

REMARKS.

In this case it was possible with the aid of Krönlein's operation to remove a tumor, 22 by 30 mm. in size, from the orbit, preserving the eye and restoring its vision. It is very questionable whether this tumor could have been removed in any other way without sacrificing the eye. Krönlein¹ described this method in 1887, and recommended it

¹ Krönlein, "Zur Pathologie und operativen Behandlung der Dermoidcysten der Orbita." *Beiträge zur klinischen Chirurgie*, 1889, vol. iv., pp. 149-163.

for the removal of deep-seated dermoid tumors in the orbit. The procedure did not become better known until Braunschweig's publication appeared in 1893.¹ Since then a steadily increasing number of cases have been published. Schlodtmann² was able to collect twenty-six cases where Krönlein's method had been employed; five of these were tumors of the optic nerve. Tumors involving the optic nerve require the removal of the nerve, and interference with the principal nutrient vessels of the globe is thereby unavoidable, hence the preservation of the eyeball in its normal shape is much more difficult than in the case of tumors not directly in connection with the optic nerve. The results, consequently, in these two classes of tumors cannot be compared, and our remarks will be limited to the latter class.

The other and older method of attacking the orbital tumor from in front, by entering between two recti muscles or by the temporary division of one or more of these muscles, with preservation of the eyeball, has been more or less successful in certain cases, though it is impossible to learn in how many cases the attempt was unsuccessful and the eyeball had to be sacrificed. The manipulations are necessarily difficult, the dissection has to be done at a depth, that is, in the dark; hemorrhage may be very disturbing, and the structures vital to the preservation of the eye are liable to injury; the luxated eyeball is jammed against the orbital margin during the entire operation, which may not be without danger, if the vision of the eye is to be restored or improved.

The resection of the outer wall of the orbit, which as to technic is not difficult, permits a thorough exploration of the entire orbit by gaining access to the part behind the eyeball, and the tumor can be freed from its surroundings in a much more careful manner. Whatever difficulties may arise from the size of the tumor or hemorrhage would occur in a more accentuated manner in the older method. If the attempt is unsuccessful, exenteration of the orbit can always

¹ Braunschweig, "Die primären Geschwülste des Sehnerven." *Archiv f. Ophthalmol.*, 1893, vol. xxxix., 4, p. 1.

² Schlodtmann, "Über die Exstirpation retrobulbärer Tumoren," etc. *Festschrift f. A. v. Hippel*. Halle, 1900.

be done. The replacement of the fragment of bone and its retention in the normal position do not offer any difficulty. Sokolow¹ makes four holes in the resected bone and passes sutures through them to aid in holding the bone in place; a procedure which hardly seems necessary. Braunschweig² has practised the osteoplastic resection in the treatment of orbital cellulitis with success, and thinks that it is justifiable to try this procedure for exploratory purposes.

The one disadvantage of this method is a subsequent disturbance of motility in the eye. Schlodtmann found that in the twenty-six cases operated on after Krönlein, all suffered from a more or less complete loss of abduction, except in one case where the adduction was affected, and in one where normal motility resulted. It is clear that the abducting power is interfered with either by direct injury to the external rectus or its nervous supply, or by adhesions occurring during the process of repair. The degree of annoyance occasioned by this limited motility is of course proportionate to the amount of sight regained. In the case described in this paper the disturbance of motility was very slight and not progressive; the diplopia occurring only at the outer and upper limits of the field of fixation. The incision of the periosteum should therefore be made without invading the region of the external muscle, and the dissection subsequently should be done with as little traumatism of the surrounding parts as possible.

¹ Sokolow, *Wratsch*, 1898, No. 33.

² Braunschweig, "Weitere Erfahrungen über die Krönleinsche Operation." *Ophthalmolog. Klinik*, 1897, No. 1, p. 4.

IRITIS, THE RESULT OF DENTAL IRRITATION.¹

By B. L. MILLIKIN, A.M., M.D.,

PROF. OF OPHTHALMOLOGY WESTERN RESERVE UNIVERSITY, OPHTHALMIC SURGEON TO LAKE-SIDE HOSPITAL, CONSULTING OPHTHALMOLOGIST TO CHARITY HOSPITAL, CLEVELAND, O.

WELL defined cases of inflammation of the eyes due to reflex troubles are not of sufficient frequency to make the report of a case without interest. In my own experience the case I am about to report is the only one I have seen.

According to J. W. Lawford, in Norris & Oliver's *System of Diseases of the Eye*, many observations on reflex irritation, due to decaying or decayed teeth, have been noted. Diseases of the conjunctiva, cornea, and iris have been the ones most frequently reported. Amblyopia of varying degree has been recorded by numerous writers. Ophthalmoscopic changes, however, have not been present. Secondary optic neuritis has been observed, usually following disease of the antrum or orbital cellulitis. The majority of dental reflex eye disturbances, however, have been those of diminished accommodation, and Schmidt (*Arch. für Ophthalmologie*, Bd. xiv., Abth. 1, S. 107) has noted seventy-three cases of weakened accommodation out of ninety-two recorded.

Ziem (*Centralbl. f. Augenhk.*, vol. xi., p. 358) has reported three cases of iritis from suppuration of the nasal cavity, in which the author thinks the septic material was carried through the circulation from one cavity to the other. Whether or not all reflex diseases are necessarily septic in their nature has not yet been thoroughly established. The

¹Read before the Cuyahoga County Medical Society, Feb. 1, 1900.

general trend of modern belief, however, seems to be in this direction. Certain cases of sympathetic irritation and inflammation of the eyes have been reported where it is rather difficult to believe that such is the case. Just how septic material can be carried in these cases is difficult to explain. Also, on the theory of septic infection, it is not clear how prompt relief comes by the removal of the original source of irritation. The more clinical evidence we are able to present along these lines, however, the better we may be able, as time goes on, to explain the phenomena of reflex trouble.

On the 9th of Sept., 1899, Miss C. D., æt. about twenty-three or twenty-four, called upon me and gave me the following history. Four weeks previous she had had an attack of acute inflammation in the right eye, which very greatly disturbed her vision and produced much sensitiveness and blurring, with some pain. At the time she was absent from the city in W. Va., and had been treated there by a medical practitioner. The difficulty, however, had not subsided, and my examination showed the following conditions at the time of her visit. O. D. v = $\frac{5}{8}$ — 3. O. S. v = $\frac{5}{8}$ — 2. At 20 feet there was 15° of esophoria, and $\frac{1}{2}$ ° of right hyperphoria. The movements of the eye were good in all directions. There was some general redness of the conjunctiva, the cornea was clear, the iris showed a very little discoloration, there was by oblique illumination a ring of pigment matter on the anterior capsule of the lens, and there was a nicking of the pupil at the lower margin, with an evident inflammatory band at that point. The ophthalmoscope showed the vitreous entirely clear, with a normal eye-ground, except that the upper, inner and lower margins of the disk were quite veiled. The veins were full and dark, the arteries large but not tortuous, and there was a general fine granular condition of the fundus, with probably a low myopic astigmatism. In the left eye the pupil was larger than the right, but there were no evidences of irritation other than slight striations along the vessels. An examination with Javal's ophthalmometer indicated 1.50 D. at 90° in each eye. So far as the general condition of the patient was concerned, she was a large, well-developed, robust-looking individual, who had never suffered from any serious illness, headaches, nor any eye strain, although she had completed

a course in one of the leading colleges of the country. There was not the slightest evidence of any inherited or acquired constitutional disturbance, nor was there any history of rheumatism. Under the use of atropine, the pupil dilated well and regularly in all directions except downward, where there was a very strong broad posterior synechia. This was sufficiently large to produce nearly a kidney-shaped pupil, especially during the early stages of the action of the atropine. Under the continued use of the atropine the redness and irritation of the eye, both externally and internally, gradually cleared away, so that within a month there was no evident presence of acute trouble, only there remained a band of adhesion at the original site. The atropine was then omitted and the pupil came back to its normal size in due time, leaving the eye quiet and the patient able to do a considerable amount of reading.

On the 15th of the following Nov., Miss D. again came to my office stating that the day before she had had some discomfort with the left eye, with tenderness on pressure in the upper portion. Examination indicated a considerable amount of conjunctival injection, and there were photophobia with some lachrymation and entire inability to use the eye for close work. An examination disclosed no discoloration of the iris and the pupil responded promptly to light. The condition present was very much such as would be the case in the initial stage of an acute iritis, and no doubt there was deep congestion, as was indicated by tenderness on pressure, the eye being very sensitive under the finger. She stated that the attack in this eye came on almost exactly as in the fellow eye. Immediately a boracic acid wash was ordered to be employed and hot fomentations applied for twenty minutes several times a day. There was little improvement in the congestive condition of the eye for the next five days. On Nov. 20th, in addition to the irritation of the eye, I discovered a considerable amount of swelling over the left jaw, extending nearly over the entire side of the face. Inquiry developed the fact that she had lost part of a filling from the third last molar on the left side, ten days previous. This filling had been placed two years before, but up to this time she had never had an attack of inflammation of the tooth. At this time there was much swelling and tenderness of the jaw about the tooth. The discovery of this, of course, at once put us upon our guard as to the possible source of irritation in the eye. She

stated at this visit that the day before she had had much pain all through the side of her head, and now the jaws were so stiff that they could be separated only a very little. In the eye itself there was some blurring, the injection was decidedly increased, there was a good deal of pain on accommodation and much photophobia. Inquiry at this time elicited the fact that at the time of the attack in the other eye, in August, she was suffering from the effects of a wisdom tooth just cutting its way through the gums, and it had been a source of great irritation for several weeks. With this information at hand, atropine was immediately ordered for fear of an attack of plastic iritis in this eye. The patient was also given a note to her dentist and directed to see him immediately and have the cavity of the tooth cleaned out. Three days after this, the patient reported that within two hours after the removal of the old remnants of filling and the cleaning out of the cavity of the tooth the entire irritation of the eye had disappeared and since then she had been perfectly comfortable. The eye itself showed very marked improvement in every way, the conjunctiva had cleared up, the pupil was widely and fully dilated, and an ophthalmoscopic examination at this time showed the irritation of the deeper structures to have disappeared.

It seemed to me that there could be no question as to the irritative tooth having been the cause of the inflammation in each eye. Certainly the fact of the immediate relief afforded in the case of the second eye by the removal of the contents of the tooth cavity is proof positive of the relationship between the two conditions. The corresponding history elicited in the case of the other eye likewise seems to me to indicate a definite relationship between the inflammation of the tooth and the positive inflammation of the eye. In the second attack, especially, it is extremely difficult to understand how the attack of inflammation of the eye could be due to a conveyance of septic material by any means from the tooth to the eye, unless there are physiological laws governing the transmission of morbid material from one portion of the body to another which we do not appreciate. It is not possible to comprehend the action of microbic material which produces symptoms of irritation of this sort, with immediate subsidence of the same upon the removal of the

original source of infection. Of course in the second eye that was involved in this case, we must remember that there was not a positive iritis, with the throwing out of plastic material, which was present in the previous attack, but it is not at all improbable that such would have been the case if the original irritation had been allowed to continue a sufficient length of time to produce a manifest state of inflammation. At present there is no way of knowing how long after the first attack it was until the iris became adherent to the lens capsule. Since then the patient has gone on with no discomfort whatever, and has made a most happy recovery.

A CASE OF CONTUSION INJURY OF THE EYEBALL, FOLLOWED BY FULMINANT GLAUCOMA; RECOVERY WITHOUT OPERATION.

BY H. L. MYERS, M. D., NORFOLK, VA.

ON account of several peculiarities of this case which, in my experience, are unique, and of which I have found no exact parallel in the literature of the subject, I have thought it worthy of report to the profession, and beg to submit the following from my case-book:

On August 19th, Mr. J. L. C., while a passenger on a railroad train running at full speed, was struck in the right eye by a stone, about the size and shape of a guinea-hen's egg, thrown from without by a malicious negro youth. The stone shattered the thick glass of the car window and came in contact with the eyeball with sufficient force to daze the patient completely and effectually destroy the vision of the eye for some time, not to speak of the excruciating pain inflicted. After perhaps fifteen minutes were consumed in stopping the train and instituting a fruitless search for the offender, the patient was placed in a berth, and iced towels were applied until his arrival at my office in Norfolk two hours later.

At this time an examination revealed no contusion or swelling of the lids, which would seem to indicate that so sudden and unexpected was the blow they could not be closed in time to assist in the protection of the ball. The pain had greatly subsided and, strange as it may seem, the only evidences of injury were a bluish-red spot about the size of a dime over the lower-inner quadrant of the ball in the ciliary region, a small hemorrhagic extravasation under the surrounding conjunctiva and a slight hemorrhage in the anterior chamber. The latter was, however, sufficient to prevent a satisfactory examination of the interior of the eye at this sitting.

The pupil was somewhat contracted, iris intact, tension normal, chamber of normal depth, conjunctival and other coats unbroken, and vision $\frac{1}{200}$. The eye was thoroughly cleansed, a one per cent. solution of atropia instilled, and the patient put to bed with instructions to keep iced applications to the eye for several hours.

Aug. 20th.—On this date the eye was free from pain, only slightly tender on pressure in region of injury, extravasation under conjunctiva more extensive, but hemorrhage in anterior chamber reduced to the extent of permitting a satisfactory examination of the fundus. Pupil dilated ad max. from atropia, chamber normal depth, tension normal, vision $\frac{1}{60}$. The ophthalmoscopic examination revealed a very slight hemorrhagic extravasation in the vitreous in the region just under the contusion. In the region opposite, *i. e.*, in the upper-outer quadrant, there was presented a typical picture of commotio retinæ, and within this whitish area were several small subretinal hemorrhages. No lesion in the macular region, and no trouble with the optic nerve was observed. Treatment of the 19th was continued. For the next three days the condition, with the exception of some improvement in the commotio retinæ, remained practically unaltered.

Aug. 24th.—To-day patient complained of some pain, described as a "steady ache," and his vision was "somewhat blurred." Pupil dilated, iris congested, but no adhesions, eye *very tender to pressure*, and I noticed for the first time that the anterior chamber had become very shallow, the iris being pushed almost in contact with the posterior surface of the cornea. The hemorrhage had entirely disappeared from the anterior chamber. The ophthalmoscope revealed no deposit on the posterior surface of cornea, but a slight—apparently sero-fibrinous—deposit on the posterior surface of the lens, a very few hemorrhagic flocculi in the vitreous, and a beginning neuritis. The evidences of retinal concussion had entirely disappeared, and the small hemorrhagic spots in this region were much smaller. It was observed that the lens was slightly tilted at its upper-inner quadrant, the pupil was not exactly round, and the iris was bulged slightly more forward over this part of the lens. The tension was little elevated, certainly less than one would expect with the above mentioned conditions. The artificial leech was applied to the right temple, small doses of potassium iodide were ordered, and a myotic, composed of eserine sul. gr. $\frac{1}{4}$, pilocarpine mur. grs. ii., aquæ dest. $\frac{3}{4}$ ss., ℥ Sig.—Two drops to be instilled every two hours until extreme myosis is accomplished,

was used. Up to this time the eye had been protected from the light by a bandage, but at this time the eye became so sensitive to the pressure of a bandage that a shade was substituted.

Aug. 25th. — To-day eye is free from pain, pupil contracted fairly well under myotic, but chamber of no greater depth, nerve head more congested. Ball very tender to pressure. Tension very slightly elevated. Treatment: Myotic, iodide potash, hot applications, and derivatives.

This condition changed very little for the next three days, and the patient becoming very restless and uneasy I suggested consultation. Accordingly Dr. John Dunn and Dr. J. P. Davidson of Richmond were consulted, the patient standing the short trip necessary to reach them with no discomfort to the eye. The consultation, while revealing some difference of opinion as to the gravity of different symptoms, resulted in an endorsement of my treatment, and a recommendation of its continuance as long as the eye remained in this condition. The patient spent a good night and experienced no discomfort during the trip to Norfolk the next morning, but on the day following, the eye being slightly painful, the leech was again applied with the result of lessening the pain and tenderness. The chamber remained the same. From this time there was little discomfort experienced until Sept. 6th, when the eye again became painful and the leech was once more applied.

From this date the eye gradually improved in all respects and I was beginning to congratulate myself that the worst was over, and encouraged my patient by the expression of this belief.

Sept. 12th, one week later, I was hastily summoned to relieve him of an "agonizing pain" in his eye. I found him much depressed, rolling and tossing with pain, extremities and body cold and clammy, much nauseated and vomiting, lids somewhat swollen, great ciliary congestion, cornea clear, pupil slightly dilated, iris congested, chamber *so deep* as to suggest adhesion to lens, no adhesions of iris, but a slight exudate in pupillary space, vision abolished, tension + 3. In short he was wrestling with an attack of fulminant glaucoma (acute cyclitis). Treatment: $\frac{1}{4}$ grain morphia sul. hypodermatically, leech to temple, myotic, and hot applications to body and extremities. He became much more comfortable under this, and there was noted a slight decrease in tension. Consultation was again held. Dr. Dunn responding, Dr. Bryant, the patient's family physician, was also requested to be present. Dr. Bryant reported that the patient had for years been a victim of

malaria and had once had a congestive chill. This determined us in trying the effect of full dose of quinine combined with sodium salicylate. He was accordingly given during the succeeding twenty-four hours eighty grains of quinine and thirty grains of sodium salicylate. These were administered per rectum as his stomach would not retain anything. Only thirty grains of the salicylate could be retained.

On the following day the condition of the eye was markedly improved in all respects, tension $+1$, ciliary injection diminished, pupillary area much clearer, pain slight, vision improved to the extent of recognizing faces at close range. The quinine was continued to the point of slight cinchonism throughout the following week, and then withdrawn. From this time recovery was rapid, and in four weeks the eye was free of all trouble except a slight paresis of the sphincter iridis. Vision, with the assistance of a mild myopic cylinder, $\frac{1}{8}$.

The features of interest to me in this case are: (1) The slight mechanical injury to the ball from a blow of such violence. (2) The forward dislocation of the lens coming on several days after the injury in the absence of much tension. (3) The long-delayed high tension and cyclitis in the presence of an apparently closed iris angle for nineteen days. (4) The suddenness of the attack just as there seemed to be some deepening of the chamber and when patient seemed in a fair way to recovery. (5) The rapid subsidence of the extremely acute inflammation under full doses of quinine.

CONTRIBUTIONS TO THE DIAGNOSIS, SYMPTOM-
ATOLOGY, AND STATISTICS OF CON-
GENITAL COLOR-BLINDNESS.

BY DR. WILIBALD A. NAGEL,

INSTRUCTOR IN PHYSIOLOGY AT FREIBURG-IM-BR.

Abridged Translation by Dr. WARD A. HOLDEN.

(With four figures on Plate II. of Vol. XXXVIII., German edition, and one diagram in the text.)

OF the different methods employed for the diagnosis of congenital typical color-blindness, the colored worsteds of Holmgren and the pseudo-isochromatic plates of Stilling are those most widely used.

When I recently went through these tests it appeared that I was not color-blind, but had a weakened power of discriminating between colors, a so-called reduced color-sense.

In fact, however, as I have long known, I am typically color-blind, being a deuteranope¹ according to v. Kries's method of designation, green-blind according to Helmholtz's nomenclature, and relative yellow-seeing, red-green blind in the sense of the supporters of Hering's color theory.

They that believe in the cure or improvement of color-blindness by practice would have regarded the results of the

¹NOTE ON NOMENCLATURE.—A person who possesses the three fundamental color-perceptions according to the Helmholtz theory—red, green, and violet—is said to be trichromatic; if perception of one color is wanting (partial color-blindness) he is said to be dichromatic. According to von Kries's nomenclature, one who is red-blind is called a protanope, one who is green-blind a deuteranope, and one who is violet-blind a tritanope.—TRANS.

tests as an argument in their favor, since I have been occupied in the last ten years with the comparison of colors in the spectroscope, etc. I knew, however, that I was color-blind and that the tests employed were insufficient. I had never practised with the Holmgren or Stilling test and the fact that in my case a wrong diagnosis was obtained by the use of the tests most generally employed led me to try the reliability of these tests in the case of other people. It soon appeared that the methods of Holmgren, Stilling, and some others are in part wholly unreliable, and in part reliable when certain precautions are taken.

I—ON HOLMGREN'S WORSTED TEST.

In order to show how greatly the results of the test depend upon the collection of yarns used, I wish to present the findings with four different sets. In the Freiburg Physiological Institute were three different sets: one selected from local shops, one put on the market by Dörfel of Berlin, and the third obtained from Letty Oldberg of Upsala.

In my first trial with the Berlin set I matched with the light-green sample, gray and grayish-brown (but not rose) as well as green. According to Holmgren, such an error does not prove the existence of color-blindness. As I show later a number of persons who made this mistake had not a dichromatic but a trichromatic color-sense, although with diminished powers of differentiation.

The second test with purple (or rose) is supposed to show whether there is color-blindness or only a reduced color-sense. He that matches only purple with the test-color may, according to Holmgren, have a reduced but nevertheless a trichromatic color-sense.

With this purple test I did not make a single blunder and felt quite positive in distinguishing purple from gray, bluish green, red, and violet. Nor with Holmgren's third test with a saturated spectral red did I make any mistakes.

In tests with another set of worsteds I made no blunders with either the green or the purple.

I then went to the eye clinic and made the tests successfully with their set of worsteds, and was assured that I was

not color-blind but at the most merely weak in color-sense, since I selected the colored yarns rather more slowly than persons with normal trichromatic perception.

The Swedish set was better than the rest in that it contained more confusion colors and when only a few greens were left in and the bluish-greens and yellowish-greens were removed, I failed almost always on the green test. Holmgren intended the bluish-greens and yellowish-greens to be used only in the tests for the diagnosis of tritanopsia and stated that these yarns should not be mixed with the others. If bluish-greens were present I carried out the test successfully.

I was successful with the purple test also, when the Swedish set was used. According to the results obtained with the best of the worsted tests, I was what Holmgren would call "incompletely color-blind." Yet in my case this diagnosis was entirely wrong, although as a matter of fact my case is exceptional, and I have found but a single other green-blind person who blundered in the test for green but did the purple test successfully. My experience with the purple test can hardly be used as an argument against the practical value of Holmgren's method.

There is, however, one practical point that I wish to call attention to. In my case I matched the purple test skein perfectly, but failed always on the green when the set of yarns was properly composed. Yet Cohn and Daae have proposed that the purple test be made first and the green resorted to only when mistakes have been made with the purple. This "simplification" of the test in the light of my personal experience does not seem judicious.

In Holmgren's statistics the red-blind and the green-blind appear in about equal numbers, and in many other statistics the red-blind predominate. In our extended tests many more green-blind were found than red-blind. On the other hand, we found but a single case corresponding to what Holmgren calls "incomplete color-blindness," but such cases Holmgren found to be nearly as frequent as the combined red-blind and green-blind. Is it not probable that many of Holmgren's cases of "incomplete color-blindness" were in reality cases of green-blindness?

However this may be, to my mind the green test should be retained as the first test, and in general tests of large numbers of persons it should be considered the decisive test in diagnosing whether or not the color-sense is normal. The purple test cannot be neglected since it is the most convenient for distinguishing between protanopes and deuteranopes.

When large numbers are not being tested at a time and there is opportunity for more extended tests, it is advisable not to limit the tests to green, purple, and red, but to make other tests. Apart from the test mentioned above for the detection of tritanopsia, namely, separating all greens into a group of blue-greens and a group of yellow-greens, the use of a brownish-green and of a saturated violet is advisable. This test again serves to distinguish protanopes from deuteranopes. The latter match blue with violet, and if they add purple also, green-blindness is practically excluded, and if any color-blindness exists, only red-blindness can be thought of. Furthermore, as I shall show below, a blunder with the violet test proves just as little as a blunder with the green or purple test that the color system of the person being tested is dichromatic.

II—ON DAAE'S COLOR CHART.

Dr. Daae's arrangement for testing with the colored worsteds consists of seventy colored fields arranged in ten horizontal rows on a chart. One row contains greens of various luminosities, another reds, and the others mixed colors. The person examined states whether the first row appears uniform in color, and then succeeding rows are observed. If he calls a row uniform which is not, he is color blind.

The main fault with this arrangement is that in the really isochromatic rows the successive squares gradually grow darker, while in the pseudo-isochromatic rows light and dark, saturated and unsaturated colors follow at random. Therefore, even to the person with dichromatic color-perception, it is at once evident that these rows differ from the others. The first time that I saw the chart I picked out the lines

correctly. The principle of the method is good, but the present arrangement of colors bad. In each row the sequence of colors, whatever the hue, should be from light to dark; and interspersed here and there should be rows of uniform color.

III—ON STILLING'S PSEUDO-ISOCROMATIC COLOR CHARTS.

Next to the worsted test, Stilling's charts are most frequently used. The advantages of the test are its simplicity, the fact that the person being examined need not even know that his color-sense is being examined, and the fact that the person being examined does not need to be directed actively by the examiner, so that embarrassment is less likely to be a disturbing factor in the test. But the test has many disadvantages which must not be overlooked.

In the directions there is no information as to the distance from which the charts should be viewed. Some ophthalmologists place the charts at a distance of 3 *m*, others put them into the patient's hands. For my own part, most of the charts at 3 *m* distance cannot be read at all, or with difficulty. At 2 *m* they are read with more ease, and at 1 *m* much more readily.

Stilling says: Charts I, II, III, IV, V, VI, and VII, serve to determine the color-sense for red-green. He that cannot read all the first three is red-green blind. He that cannot decipher all of IV and V, but reads I, II, and III, has a diminished perception for red-green. He that cannot decipher VI and VII is also red-green blind, but these two charts serve to distinguish the two chief forms. He that can read VI but not VII has a diminished perception for red, *i. e.*, a spectrum shortened at the left end. He that can read VII but not VI has an unshortened spectrum and normal or almost normal perception of red. Chart VIII serves to determine the color-sense for blue-yellow. He that claims that he cannot read chart X is surely a simulator. He that claims to be red-green blind must be able to read Chart X; the inability to read this is a proof of simulation.

Tested with Stilling's charts at a distance of 3 *m*, I found that I was

- a) according to Charts I–VI taken together, red-green blind ;
- b) by comparison of VI and VII, red-blind (protanope), with shortened spectrum ;
- c) according to II and IV, normal ;
- d) according to IX, a simulator ;
- e) according to X, at least not a crude simulator.

In tests with the charts near by, I was

- a) according to Charts I–V taken together, not color-blind, but had a diminished perception of red-green ;
- b) according to VI and VII, not red-blind, but rather green-blind (deutanope), with unshortened spectrum ;
- c) according to IX and X, a simulator (as above).

In fact, I am a typical deutanope, with unshortened spectrum. Similar confusing results were obtained in testing a number of typical protanopes and deutanopes. These results are not only of theoretical interest, but of practical interest as well, since they show that these charts are utterly unsuited for testing seamen and railway employés.

IV—ON PFLUEGER'S CONTRAST METHOD.

This method of testing the color-sense is related to that of Stilling and has the same advantages, but, as it seems to me, it is less adapted than the other as a sole test for the determination of color-blindness. In this test black and gray figures and letters, printed on a colored ground, are covered with from one to three sheets of silk paper. The characters then become invisible to the color-blind, but persons with good color-perception see them in a color complementary to the ground.

The first disadvantage of the method is that the sheets of silk paper soon do not lie flat, and in being smoothed out are quickly soiled and wrinkled. Furthermore, the normal eye will not always be able to decipher all the charts.

In the accompanying text there is no statement as to what may be expected from a normal, a weak, and a dichromatic color-sense. Every one who uses Pflüger's charts must obtain this necessary information by tedious experiment.

I am convinced that after this experience is acquired one

can differentiate normal, weak, and dichromatic color-sense satisfactorily, but many false diagnoses will first be made if this test alone is relied upon. The differentiation between one actual color-blind and a trichromatic person with reduced power of distinguishing differences of color, will be difficult, since both will read approximately the same lines.

V—ON NEW PSEUDO-ISOCHROMATIC COLOR CHARTS.

The unfavorable experience I had had with the Stilling and Pflueger color charts led me to devise a set for my own use, which would fulfil the purpose even if the reproduction of the printed plates should not be altogether perfect.

With color charts made according to Stilling's principle, if the apparent similarity between the ground and the printed figures is not absolute, the person with dichromatic color-sense will recognize the figures despite his color-blindness. The figures need not appear to differ in color, but a slight difference in luminosity will enable him to follow the contours and recognize the figures.

If, however, colored dots, which appear nearly alike to one with dichromatic color-sense, are arranged in irregular sequence in a circle, this color ring will appear to him, even if the confusion colors are not accurately reproduced, similar to or identical with another ring of dots of uniform color but of different luminosities. For example, a ring in which green and gray dots alternate will appear to him identical with a ring in which light- and dark-gray dots alternate, or with one in which light and dark-green dots alternate. All these rings will appear to him to be of one color, and if the colors are carefully chosen, the ring composed of two colors may give him more the impression of being of a uniform color than the ring actually of one color with its dots alternatingly light and dark.

I have had charts of this sort reproduced by lithography and published by J. F. Bergmann, Wiesbaden, with detailed directions for use. Four of these rings are shown on Plate II., accompanying this article, not for the purpose of being used for the detection of color-blindness (all twelve charts must be used for this), but merely to illustrate the points I have

been making. The collection of twelve charts contains three color rings, which will be declared by all persons having normal color-perception to consist of a single color only (see Fig. 5, Pl. II.); rings which contain the typical confusion colors of the protanopes, deuteranopes, and tritanopes; and one ring which cannot strictly be considered of uniform color but whose recognition does not indicate color-blindness. The rings are to be viewed from a distance of $\frac{3}{4}$ m.

This method is not a new one, but is rather a combination of Stilling's and Daae's methods, which appears to me to have advantages over both. In order that reliable results be obtained and accurate diagnoses made, it is necessary that the test should follow the directions laid down.

When large numbers of persons are to be examined, this method of examination is no more advisable than are those of Stilling and Daae. If the purpose of such investigations is to discover the cases of typical color-blindness, I would recommend the employment of my color apparatus for diagnosis, described below. If those weak in color-perception are also to be discovered, Holmgren's test should be used, but the results should be controlled by using the spectroscope or one of my two diagnostic methods, since otherwise, as I shall show farther on, a number of persons with weak color-perception might be declared to be color-blind, and, on the other hand, persons with dichromatic color-sense might be classed as having a weak trichromatic color-sense.

VI—A NEW METHOD OF TESTING WITH COLORED GLASSES.

(An apparent equivalency of red and yellow.)

In 1896, Prof. v. Kries was experimenting with me and other persons with dichromatic color-sense, by making equivalent reds and yellows by means of Helmholtz's color-mixing apparatus. It struck me at the time that these comparisons, which are so well adapted for separating the two most frequent types of color-blindness, must also be well adapted for the practical diagnosis of color-blindness. When my eye is fairly adapted for light, the varying of luminosity

alone will cause red and yellow to appear to me equivalent. This is also the case with the red-blind, except that the red must be made five times more luminous than in the case of the green-blind. I tried the following method on some actual dichromatic persons, and also on two who were sent to me as being color-blind, but were proved not to be so.

1. I made a comparison of lithium red and sodium yellow, which was unequivocal for both types of dichromatic persons, *i. e.*, I made the red much darker for my eye than the yellow; for the protanope, therefore, the dissimilarity was much greater. When asked what colors they saw, the dichromatics answered, as was expected, that the red was red, and the yellow yellow.

2. I then made the red lighter until, for my eye, it was equivalent to yellow. The deuteranope said, as I expected, that both fields were yellow. At that time I could not examine any protanopes, but, as I now know, they would have called this yellow yellow, and this red either red or green. For them the red is darker than the yellow, and the dichromatic person suspects, in such cases, that two different colors are presented to him, and he therefore names two different colors, while in reality both fields appear to him as different intensities of the same color.

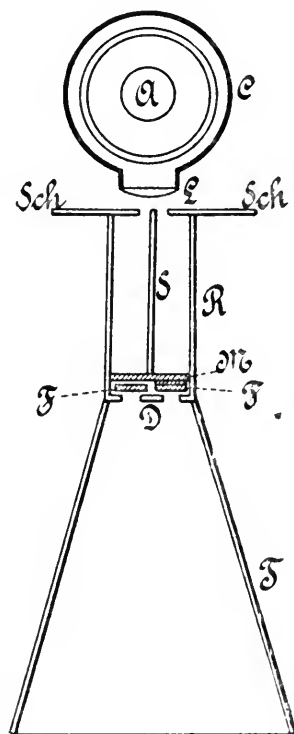
3. I now made for the protanopes an equivalency by making the red five times lighter. Now, the deuteranope always called the yellow red, and the red yellow, supposing that I had merely reversed the first order, the field which now appeared darker being called red. The protanope regarded the colors as equivalent in this third arrangement, although he said that one field was slightly lighter than the other; he did not speak of any difference in color.

With these three arrangements the diagnosis is assured.

The normal-sighted person, of course, regards none of these arrangements as equivalent. Even persons with greatly reduced perception of color differences never hesitate to call the red field red, and the yellow yellow, no matter which is lighter.

For practical purposes a very simple instrument may be

used. I found that sufficiently equivalent small fields could be obtained when a red and a yellow glass were placed before an Auer burner, and suitable smoked glasses then placed over the yellow. An apparatus devised on this principle was made by Elbo, at Freiburg (at a cost of twenty-five to thirty marks, including the burner). A horizontal section of the instrument is shown in the figure. A is an Auer



burner inclosed in a metallic cylinder, *c*, in which is mounted a plano-convex lens, *L*. The rays collected by the lens pass into the tube *R*, which is divided by a vertical partition, *S*. At its proximal end are adjustable screens, *Sch*, and at its distal end a piece of ground glass, *M*. Beyond this is a tin funnel, *T*, blackened on its inner surface. At the smaller end of the funnel is a diaphragm of blackened tin with two semicircular openings 1 *cm* high. Through these openings one sees the illuminated ground glass, behind which may be slipped pieces of colored glass, *F*, *F*.

The ground glass serves to give a uniformly luminous field behind the semicircular colored fields, whatever may be the arrangement of the screens. The screens make it possible to alter the luminosity of either color field independently of the other. The colored strips of glass usually employed are one of light-red ruby glass and one of yellowish orange darkened with a smoked glass which is cemented to it.

With this apparatus the test is made as follows when it is a question of determining as quickly as possible whether the patient has a dichromatic or a trichromatic sense:

(a) I put a red glass in each side, and open the slit *ad maximum* on one side and but slightly on the other, so that one field appears a dark red and the other a luminous bright red.

The patient sits at a distance of 2 m from the end of the instrument, and the question is asked: What colors are seen?

The trichromatic person answers: Light red and dark red. The deuteranope answers: Yellow and red, or yellow and green. The protanope answers: Red and green, or red and dark.

(b) I push the other diaphragm in until the two color fields are equally luminous.

Question: Are the two fields alike?

The trichromatic person answers: Yes.

The dichromatic: Yes, although the luminosity of the two will not appear exactly the same in all cases.

(c) I replace one red glass by a yellow glass darkened with a smoked glass, open the slit for the red *ad maximum* and that for the yellow only to a point marked II (here there is equivalency for the deuteranope).

Question: What is the color now?

The trichromatic answers: Red and yellow; or, red and brown; or, red and whitish; or, red and green.

The deuteranope answers: Yellow (one lighter than the other); or, both alike.

The protanope answers: one is darker than the other; or, yellow and green; or, red and green; or, yellow and red (reversing the two).

The deuteranope is now recognized. For the more accurate diagnosing of the protanope I proceed as follows:

(*d*) The diaphragm behind the yellow is now pushed in to mark I (equivalency for the protanope), and the question is put : Are both alike now ?

The trichromatic answers: No (the yellow is darker, more or less brownish).

The protanope answers : Both are alike now.

The entire test is completed in a minute or less, except in the case of trichromatic persons with a greatly reduced color-sense.

The purpose which I have in making these four arrangements, *a-d*, may be explained briefly as follows :

In *a* (light red and dark red) I am acting on the experience that all dichromatics, when two such fields of unequivalent luminosity are presented, believe that one is testing their color-sense, and the unequivalency of luminosity is regarded as unequivalency of color. The answer is therefore false, and almost all dichromatic persons reveal their color defect by this first answer.

In *b* (two equivalent red fields) the intention is to show to the patient that equivalent combinations are actually brought about. The dichromatic person, who is very particular about noticing slight differences of luminosity, here gains the impression of equivalency, and is therefore less likely to doubt the apparent equivalency of the red-yellow arrangement which is used in *c*. Here the deutanope states that both fields appear yellow, if the relations of luminosity are right. The protanope usually betrays himself in this test, and always in *d*.

The procedure may of course be varied in many ways. That given above is the most convenient for examining great numbers of persons.

VII—RESULTS OF THE EXAMINATION OF NUMBERS OF SCHOLARS AND SOLDIERS.

In order to determine the value of my method of testing for color-blindness, I thought it advisable to undertake extensive tests. Therefore, 1322 scholars in 3 schools were examined, among whom 23 deuteranopes were found, and

11 protanopes; and 1420 soldiers were examined, among whom 30 deuteranopes were found, and 23 protanopes. The total figures give a percentage of 3.17 % of dichromatics (1.9 % deuteranopes, and 1.3 % protanopes). Taken together with the 20 cases reported by v. Kries, this differentiation of type has been brought out in 107 dichromatic persons.

One advantage of my method is that school children of the lowest classes could be examined as easily as older persons; also, simulation was readily detected.

VIII—COMPARATIVE INVESTIGATIONS OF THE RESULTS OBTAINED
WITH HOLMGREN'S TEST AND MY OWN.

(Experiences with cases of incomplete color-blindness and reduced color-sense.)

Double tests were carried out in the following way, the material consisting of an infantry regiment: I examined each man first by my method, and then Dr. Bibler carried out the Holmgren test. Of the 1420 men examined, the worsted test revealed only one more person with dichromatic color-perception than I had found with my test, and this error could not properly be attributed to the method. One day, feeling ill, I had tried shortening the test, using only two comparisons, and in this way one protanope was overlooked.

On the other hand, the worsted test apparently showed many persons to be dichromatic when more detailed examinations by various methods, including the use of the spectroscope, showed that they had in reality a trichromatic color-sense, but a more or less reduced power of discrimination between colors. With my pseudo-isochromatic charts the persons with reduced power of discrimination revealed their defect very readily, while they still showed that they had specific perceptions of red and green.

In 39 cases out of 1420, the worsted tests apparently showed the person to be a protanope or deuteranope, when in fact he was not. If these cases are included, the percentage of color-blindness among the soldiers was 6.48 %; omitting these cases it was 3.73 %.

The peculiarity of the color-sense in these persons is undoubtedly a weakened perception of color in the greater portion of the visual field, while at the fovea colors are fairly well differentiated. Both of my tests deal with the color-sense of a relatively small central area of the retina. It should be remembered that railway and marine employ  s require good color-perception only in the central portion of the retina, when it is a question of recognizing distant lights or flags.

It is remarkable, and not readily explainable, that those persons with reduced color-sense, in judging of large colored areas, are guided rather by their reduced color-sense in the peripheric and paracentral portions of the retina than by their more accurate color-sense at the fovea, and thus confound the test worsteds, which in fact are of more saturated color than my charts.

I do not wish to discuss this question further, as Holmgren's conception of incomplete color-blindness is obscured by the many typographical errors in his book. I quite agree with him, however, in believing that reduction of the color-sense may vary greatly in degree, from a slight disturbance which can scarcely be made out, up to one so considerable that most tests would show it to be true color-blindness.

In fact, however, the last-mentioned form is sharply distinguished from a dichromatic color-system by the existence of a third component making the color-system trichromatic.

I wish to state in conclusion that I regard it unjust to consider as color-blind all those who make mistakes with the worsted tests, and to refuse them employment in the marine and railway service. Holmgren's test is not a reliable one for determining the ability of a person to recognize colored lights and flags. In my opinion, tests for this purpose should deal with the color-sense of the fovea alone, or with the immediately adjacent central portion of the retina. My own test for this purpose is done with a blackened disc 10 *cm* in diameter, with a ring of perforations 1 *mm* in diameter, covered with bits of glass of various colors, and illuminated by an Auer's burner behind it. This is viewed from a distance of 1 or 1.5 *m*, and as the different colors are brought before

the light the person is required to name them. The dichromatic person, viewing such an isolated point of light and having nothing to compare it with, is quite helpless, and blunders greatly in naming the colors. Gray is usually called green; and dark orange, red, and yellow-green appear alike to him. The person with reduced color-perception makes mistakes as well. He calls light-blue green, and saturated green blue, but he distinguishes readily yellow-green, red, and yellow, and he distinguishes gray and green also.

In a series of cases in which the diagnosis as determined by Holmgren's method did not agree with that determined by my color apparatus and charts, this method of the luminous points always confirmed my diagnosis, and persons whom my tests showed to be dichromatic always exhibited the typical blunders when examined by means of the luminous points.

It is my intention to undertake further experiments for the purpose of determining exactly the status of persons with reduced color-perception as regards the recognition of signals, whether they are to be classed as color-blind or as having sufficient color-perception for the recognition of signals.

GLAUCOMA AFTER NEURO-RETINITIS ALBUMINURICA. A CONTRIBUTION TO THE PATHOLOGICAL ANATOMY OF GLAUCOMA.

By DR. EUGENE WEHRLI,

ASSISTANT TO THE EYE CLINIC AT BERNE.

(*With Plates A—D of Vol. XXXVII., 1898, German Edition.*)

Abridged Translation by Dr. WARD A. HOLDEN.

INTRODUCTION.

THE clinical picture and the pathological changes found in albuminuric retinitis have been accurately studied and the pathology is sufficiently well known. Somewhat less numerous are the pathological papers on simple hemorrhagic glaucoma, but its pathology has been so far studied that anything new is not easily to be found. All authors agree that the ocular changes in albuminuria differ from the retinitis hemorrhagica due to senility and arterio-sclerosis not only as regards the stellate figure at the macula, but also as regards the papillitis that may appear with or without hemorrhages, and the fatty degenerations. The two diseases are therefore described independently in the text-books, and, when such a separation of the diseases is made, the complications of each fundamental disease seem worthy of separate study and investigation.

When the etiology plays so important a role in the pathology as is the case with retinitis albuminurica, the interest in the affections accompanying it will be so much the greater, and having recently seen two cases of retinitis albuminurica

complicated with glaucoma, it seemed to me worth while to study carefully the changes in the two enucleated eyes, because this complication, although recognized, has not had much attention paid to it. The first case is the more interesting since the retinal affection was unilateral, while in the other patient, a man of thirty-seven, there were new formations in the vitreous, suggesting retinitis proliferans (MANZ).

My thanks are due to Prof. Pflueger for allowing me to use the specimens and the clinical histories, and to Dr. Siegrist for making the drawings and rendering me other assistance.

RÉSUMÉ OF THE LITERATURE.

The reports of the outbreak of glaucoma in eyes with retinitis albuminurica are quite rare. In most of the text-books, no mention is made of this complication, nor is it spoken of in Graefe-Saemisch.¹ In mentioning the affections which may lead to secondary glaucoma, the following passage occurs: "When hemorrhagic processes in the retina are of long duration, yellowish white plaques may appear at the site of the old foci, resembling those seen in albuminuric retinitis."

In a similar way Stellwag² says that the retinal hemorrhages may soon become combined with symptoms of retinal inflammation, which, with the marked cloudiness and the focal exudations may resemble the picture of nephritic neuro-retinitis. That there may be a complicating acute glaucoma is not mentioned.

Panas³ merely cites the case reported by Weeks, which will be alluded to later.

Michel⁴ alone states that the changes of the vessel walls in the iris when there is glaucoma are worthy of attention because sometimes glaucoma may come on in cases of contracted kidney, frequently simultaneously with a so-called albuminuric neuro-retinitis, or in the course of such a retinitis, being then due to hyaline changes in the walls of the vessels in the iris and retina.

The following cases have been reported :

In a short note Graefe⁵ stated that in all the cases of retinal affection accompanying albuminuria that had come under his notice, glaucoma had occurred in but one, and in this case the glaucoma appeared to be due not to the nephritis, but to an atrophy of the kidney dependent upon arteriosclerosis.

Hutchinson⁶ reported the first microscopic examination. The left eye of a man of forty-five, which had become blind from albuminuric retinitis some weeks before, showed signs of acute glaucoma, such as pain and increased tension. In the enucleated eye white patches and hemorrhages were found in the macular region. The patient had been treated in a hospital for chronic interstitial nephritis. The right eye remained normal. After the enucleation the general condition improved, the albumen disappeared from the urine, and the patient was discharged apparently cured.

In a collection of twenty-nine cases of primary glaucoma uncomplicated with hemorrhage, Brailey⁷ found one case with optic neuritis and albumen in the urine. Microscopically there were found some atrophy of the ciliary body with signs of inflammation, peripheric adhesions of the iris, blocking of Schlemm's canal, dilatation of the ciliary vessels, inflammation of the optic nerves, thickening and hyaline degeneration of the retina, and slight episcleritis.

In the same paper the author describes twenty-one cases of glaucoma with hemorrhages in the retina. One patient, a woman of fifty-three, suffered from albuminuria, and had been blind in the left eye for three months from glaucoma and hemorrhage. Iridectomy had been made up and down, then sclerotomy without result, and finally enucleation. Microscopically there were found moderate atrophy of the ciliary muscle, inflammation and peripheric adhesions of the iris, closure of Schlemm's canal, no dilatation of the ciliary vessels, inflammation of the ciliary body, and nothing unusual in the arteries of the retina.

Pagenstecher⁸ reported the case of a woman of fifty-six with contracted kidney, who became blind quickly from glaucoma two years before her death. The right eye was phthisical, with staphylomata and detachment of the retina.

In the left eye there were also hemorrhages, and hyaline degeneration of the vessels in the retina.

Schnabel's⁹ paper on glaucoma contains a description of a case of acute glaucoma in an eye with albuminuric retinitis and hemorrhages, which was successfully treated by iridectomy. A woman of fifty with œdema and hypertrophy of the left ventricle, due to nephritis, lost the sight from a hemorrhage into the vitreous, and two months later symptoms of glaucoma appeared that were relieved by iridectomy. There was no excavation. The diagnosis of chronic nephritis was confirmed at the autopsy made three months after the outbreak of the glaucoma.

The iris was adherent to the cornea at the periphery, the canal of Schlemm was normal, the ciliary body was distorted, the iris drawn into the operation wound, and the ciliary muscle was atrophic, but the ciliary processes were normal. In all layers of the retina there were hemorrhages and the nerve-fibre and ganglion-cell layers were highly atrophic. The disc was swollen, and the vitreous contained groups of red blood corpuscles.

Weeks¹⁰ in his paper on albuminuric retinitis described among five other cases one with glaucoma. This case is interesting because, as in Hutchinson's case and my second one, there was unilateral albuminuric neuro-retinitis with hemorrhages, which, two months later, became complicated with acute glaucoma. There was hemorrhage into the vitreous and the tension was ± 2 . The eye was enucleated. The other eye was normal in every respect. The urine contained quantities of albumen, and granular and hyaline casts left no doubt as to the general disease.

Microscopically there were small blood-vessels in the cornea, the iris was thickened and compressed against the cornea at its periphery. In the anterior chamber there was a fibrinous exudation with a few white and red blood corpuscles. In the vitreous there were extensive hemorrhages and large branched cells. The retina showed the most advanced changes. The limitans interna was thickened and at some points broken through by hemorrhages. The nerve-fibres were swollen and the ganglion cells were swollen and

degenerated. The disc was excavated. The intima and media of the arteries had undergone a hyaline thickening, which at some places obliterated the lumen. The veins were large and distended with blood. The vessels of the iris, ciliary body, and choroid were in a similar condition. In the choroid the chorio-capillaris was obliterated.

Landsberg¹¹ reports two cases of glaucoma with albuminuric retinitis with microscopical examination, the condition having been permanently cured in both by iridectomy.

REPORT OF NEW CASES.

CASE I.—August 29, 1895. G. M., a laborer of thirty-seven, was admitted to the hospital with the diagnosis: Right, nearly absolute glaucoma; left, albuminuric retinitis.

On July 10th the right eye became red and painful, and there was pain in the right side of the forehead. Atropine was prescribed and cold applications. The eye soon became blind and then eserine was prescribed by his physician.

On admission he was found to be small and poorly nourished, pulse regular but hard, breathing normal. Palpation and auscultation revealed nothing abnormal. The blood was normal, there was no indication of syphilis, but the urine had a specific gravity of 1.030 and contained albumen.

In the right eye there was moderate conjunctival and pronounced deep circumcorneal injection; pupil large, irregular, and irresponsive to light; iris hyperæmic, cornea diffusely cloudy, no details of the fundus recognizable, uncertain fixation to the temporal side, T+2.

The left eye was normal externally and with the correcting + glass had normal vision. Ophthalmoscopically there was a low grade of neuritis with some small hemorrhages and yellowish patches in the periphery of the retina, and a slight general œdema (see Plate A).

Eserine was used and the patient was put on a milk diet.

September 3d. The pain in the right eye continued, and at the patient's request the eye was enucleated.

September 23d. The general condition had improved and the patient was discharged.

October 31st. No albumen, s. g. 1.027. In the left eye some blurring of the disc margins and some fresh hemorrhages.

July 27, 1896. He was admitted to the hospital with the diagnosis retinitis proliferans. For three weeks the patient had suffered from severe headaches with some pain in the eye, and colored spots in the field of vision. $V = 0.35$, and a defect was found in the temporal portion of the field.

Ophthalmoscopically the margins of the disc are blurred and the disc appears to be surrounded by a grayish wall over which the vessels arch (Plate B). From near the nasal margin of the disc a gray elevation runs out toward the periphery and ends in two curved points. A small round elevation was found beneath the one already described and a third lay along the temporal branch of the inferior nasal vein. The hemorrhages had disappeared, but their previous site was marked by patches of pigment. The entire fundus was diffusely veiled.

Salicylic acid and diaphoretics were employed and the patient was soon discharged, his condition remaining unchanged.

August 30, 1897. He was admitted again after stating that his vision had failed considerably within the last few weeks.

Externally the eye appeared normal, the anterior chamber shallow, the pupillary reaction normal. In the vitreous were numerous opacities obscuring the fundus. Tension $+1$, $V =$ fingers at 3 feet, field of vision not much restricted.

In the urine there was some albumen but no casts. The patient was soon discharged without any improvement in his eye.

MICROSCOPIC EXAMINATION.

The enucleated glaucomatous eye was hardened in Müller's fluid for two months and then in alcohols of increasing strength, imbedded in celloidin, and cut in vertical sections which were stained with alum-hematoxylin, and eosin.

The cornea, which normally is 0.9 mm thick,¹⁹ was here 0.79 mm thick in its central portion and between the lamellæ there were numerous small empty spaces. From the limbus many small blood-vessels ran into the cornea for a short distance both in the superficial and deep layers, and toward the centre of the cornea there were many small hemorrhages. The basal cells of the epithelial layer were irregular and oblique and at some points separated by the presence of leucocytes. The epithelium was somewhat thinner than

normal, measuring 0.026 *mm* instead of 0.03.¹³ The membranes of Bowman and Descemet were normal, and the endothelium on the latter showed no changes except where the iris lay in apposition to it.

The conjunctiva and episcleral tissue were loosened and contained foci of leucocytes and dilated blood-vessels.

The sclera, 0.39 *mm* thick at the equator, showed some round cells in its superficial layers. On the whole it was fairly normal, although a little thinner than usual.

The angle of the anterior chamber was occluded in its entire circumference. The iris was closely united with the ligamentum pectinatum and with the periphery of Descemet's membrane, in all over a distance of 1.8 – 1.9 *mm*.

The canal of Schlemm was entirely obliterated in nearly its entire extent. The iris was atrophic and greatly thinned. Its direction and relations to the ciliary body were greatly changed at its periphery by its adhesion to the cornea and sclera. The pigment epithelium and a portion of the sphincter muscle were partly everted at the pupillary margin. The iris was greatly changed in structure, an increased number of connective-tissue cells being present, and the loose, spongy tissue being transformed into a dense fibrous structure. The pigment epithelium was normal.

The anterior chamber was filled with a close network of fine fibres due to the coagulation of a fibrinous aqueous humor. In this network were many cells similar to the endothelioid cells found in granulation tissue, some of them containing pigment. No red blood corpuscles were found.

The posterior chamber was filled with the same material as the anterior.

The ciliary muscle was slightly atrophic and flattened against the sclera, losing its triangular form. The ciliary processes were normal, as were the zonula fibres.

The vitreous was very fibrillar, and posteriorly it was detached in some places by fibrinous masses transuded from the retina. It contained many scattered red blood corpuscles and many foci of corpuscles, particularly near the ora serrata. Besides the red blood corpuscles there were numbers of leucocytes in the vitreous, some small and some

large; and in the neighborhood of the hemorrhages were masses of organized tissue composed of spindle cells and a finely fibrillar material.

The choroid was of normal thickness. Anteriorly it was detached from the sclera. In the equatorial region there was a local hyperæmia, while elsewhere the larger vessels were mostly collapsed. In the posterior portion, in the regions where there had been extensive pathological processes in the retina, there were accumulations of leucocytes.

The lamina vitrea was thickened but intact.

The retina was attached to the choroid only at the ora serrata and about the disc. Everywhere else it was detached and slightly elevated, a change due no doubt to the process of preparation.

The retina was the part which had suffered the more extensive changes and no layer of it was free from alterations. Numerous small hemorrhages lay among the ganglion cells and the nerve fibres, but more were found in the nuclear layers.

At the upper temporal margin of the macula a large hemorrhage had spread out, destroying the outer reticular layer and at one point breaking through the outer nuclear layer and destroying the rods and cones. It sent a process between the pigment epithelium and the outer nuclear layer to the middle of the fovea (Plate D, Fig. 2, 6), where there were two small organized hemorrhages in the outer reticular layer (Plate D, Fig. 2, 5). These latter consisted of an irregular confused mass of spindle cells among which lay amorphous masses of blood pigment. No intercellular substance could be made out. An analogous formation, in the same location, but somewhat smaller, occupied the lower margin of the fovea and was connected with the large hemorrhage by a continuous band of red blood corpuscles (Plate D, Fig. 2).

Two small masses lay a little distance from the fovea, but still in the macula. The structure of all these masses was entirely similar, and in all probability they represented small organized hemorrhages in the fovea and macula, being distinguished by their pigmentation and by their connection

with unquestionable hemorrhages. Ophthalmoscopically they would have appeared as small round reflecting yellow spots.

From the fact that only a small portion of the hemorrhages were organized, it seems probable that this represents an older process and that the unorganized hemorrhages were of later date.

For the better understanding of the further pathological processes in the macular region, a short description of the degeneration of the retinal vessels will here be given, a more detailed description following later. The vessels showed a pronounced tendency to cell proliferation, and there was a tendency to an inflammatory hyperplastic proliferation of cells in the neighboring parts. The walls of the larger vessels often extend to the outer nuclear layer, while the normal retinal vessels are limited to the nerve-fibre layer or at the most to the inner nuclear layer. Excentric thickenings of the vessels were frequent (Plate D, Fig. 1); and a continuous series of sections showed that these thickenings presented first outward and then inward, the vessel wall becoming thicker and the lumen smaller until finally the vessel was represented merely by a solid connective-tissue strand. This process may be hastened by the formation of thrombi. Extravasation of blood into the neighboring parts is then very frequent.

About the vessels at the upper margin of the yellow spot there were proliferations of tissue, growing thicker and denser as the vessels neared the disc, until the entire structure of the inner layers was altered and distorted by these connective-tissue masses (Plate D, Fig. 1, 9).

The pigment epithelium had taken part in the general proliferation and masses of new atypical epithelial cells projected in as far as the middle of the retina.

From the new connective tissue about the macular vessels, new tissue spread not only outward through the retina but also inward toward the vitreous. Thus there was formed a flat ribbon-like membrane along the upper and lower margins of the macula corresponding to the connective tissue in the retina itself. The structure of this membrane was as

follows (Pl. D, Fig. 1): The portion next the vitreous consisted of a layer of long spindle cells, one to three strata deep. Beneath this was a thin layer of very cellular connective tissue (a 1), with little intercellular substance and numerous thin-walled capillary vessels (a 10). Beneath this was a broader layer of finely fibrillar, almost homogeneous, ground-substance (a 2), with a few oval cells and larger vessels (7). Nowhere were traces of red blood corpuscles found.

The nasal half of the retina and the equatorial portions did not show such advanced changes as the temporal half. Small hemorrhages were found here and there and the walls of the vessels were thickened, but there were no characteristic organized hemorrhages as there were about the macula.

The connective-tissue stroma of the retina was greatly hypertrophied, and Müller's fibres were thickened.

The excavation of the disc was rather between the physiological and the pathological.

The arteries entering the ball, the anterior and posterior ciliary vessels, were absolutely normal, as were also the central vessels of the optic nerve and the arteries of the iris and choroid.

The most marked changes were found in the arteries and veins of the retina. In these arteries were found all stages of endarteritis chronica deformans with its results.

Besides the extensive membrane in the macular region, smaller connective-tissue excrescences projected from the nerve-fibre layer into the vitreous farther out in the periphery of the retina. These were all in connection with the adventitia of small arteries. This proliferation of the adventitia would correspond to periarteritis proliferans hyperplastica (Ziegler¹⁴) while the proliferation of the intima would be considered an endarteritis proliferans, each being a variety of arterio-sclerosis.

The consequences of these vascular degenerations are, narrowing and blocking of the vessel on the one hand and dilatation and rupture on the other.

The veins show the same tendency to proliferation as the

arteries and often are not to be distinguished from them. The capillaries of the retina were degenerated, there being at times an increase in nuclei and at others a homogeneous thickening of the wall.

REMARKS ON CASE I.

As to the etiology of the ocular changes, when all things are taken into consideration the symptom complex accords most accurately with the idea of an acute nephritis which had already passed its acme when the patient was admitted to our hospital.

Only a few words need be said in regard to the absence of the stellate figure at the macula, since it is generally known that the presence of this figure is not the rule. Schlesinger,¹⁷ for example, found among 43 cases of nephritic changes in the retina, hemorrhages and cloudiness of the retina in 6 and blurring and prominence of the disc in 3.

Wadsworth¹⁸ among 90 unselected cases found the stellate figure only twice.

It is worthy of note that in our case there developed in the left eye within three months whitish strands in connection with the vessels, arising from the plaques and extending out into the vitreous. At the same time pigment masses appeared in the peripheric foci, which it was evident from the microscopic finding in the other eye were formed of the pigment epithelium of the retina. The microscopic changes in the one eye corresponded to the ophthalmoscopic changes found in the other.

As to the prognosis for the second eye in simple non-albuminuric hemorrhagic retinitis, according to Mauthner¹⁹ in one half the cases the second eye remains intact, in a quarter the same affection develops in the second eye without glaucoma, and in the remaining quarter hemorrhagic glaucoma some months later attacks the second eye.

Albuminuric retinitis may be recovered from even when it does not follow pregnancy or acute infectious diseases. Adamueck²⁰ reported such a case, and Michaelson²¹ described a case in which there was recovery after hemorrhagic albuminuric retinitis had lasted for a long time.

Fürst²² says: Albuminuric retinitis shares the bad prognosis of the contraction of the kidney to which it is due, yet it is certain that both affections may pass off and the ophthalmoscopic picture become normal.

I pass now to the pathological changes. The small parenchymatous hemorrhages at the corneal margin were doubtless due to injury to the ball in the course of the enucleation. Slight vascularization of the cornea is found in many pathological conditions. The cornea was slightly thinner than normal.

The angle of the anterior chamber was closed by the iris, which lay on the ligamentum pectinatum and membrane of Descemet for a distance of 2 *mm*. This adhesion of the iris, which Knies²³ used in support of the well-known theory of glaucoma, has been found in all the cases of glaucoma after albuminuric retinitis that have been reported (Brailley,⁷ Schnabel,⁹ Weeks¹⁰); it is also present in cases of simple hemorrhagic glaucoma (Brailley,⁷ Birnbacher and Czermak,²⁴ Deutschmann,²⁵ Garnier,²⁶ and others), and in secondary glaucoma in general, although Valude²⁷ expressly states that blocking of the chamber-angle is absent in hemorrhagic glaucoma.

Schlemm's canal was almost wholly obliterated. The general atrophy of the iris reached its highest grade at the point of adhesion. The tissue of the iris had become fibrous instead of spongy. This condition of the iris, together with the sclerosis of the vessels, which is found in primary glaucoma, diminishes the amount of filtration in the iris; and upon these changes and a supposed consecutive disturbance of circulation with atrophy of the ciliary body and hypersecretion of the aqueous with increased tension, Ulrich²⁸ advanced his theory of glaucoma. Birnbacher and Czermak²⁴ were unable to confirm his findings, however, they finding only hypertrophy of the connective tissue of the iris vessels with special involvement of the adventitia, but no hyaline degeneration of the vessel walls in primary glaucoma.

The atrophy of the sphincter pupillæ may be due to atrophy of the nerves in consequence of the marked thinning of the iris at the periphery.

The ectropium of the pupillary margin of the iris which occurs in primary glaucoma is, according to Knies²³ and Birnbacher and Czermak,²⁴ the result of a contraction of the new connective-tissue membrane on the anterior surface of the iris, which was found also in our case.

All the layers of the retina contain capillary hemorrhages, and a more extensive one, partly organized, lies at the macula. The highly degenerated retinal vessels show a great tendency to hyperplastic cell proliferation, and with the hemorrhages tend to cause proliferation in the neighboring tissues. In the course of altered vessels at the upper and lower margins of the macula, which form connective-tissue strands, there is a band of connective tissue between the rods and cones and the pigment epithelium.

Deutschmann²⁵ described a formation of connective tissue in the same location in a case of hemorrhagic glaucoma, but as it contained remaining portions of elements of the blood he regarded it as an organized hemorrhage.

In our case neither blood pigment nor fibrin was present and the band showed little similarity to the organized hemorrhages in the fovea and at other places. This formation seems to me to have proceeded rather from the supporting tissue of the retina with which it is in direct relation and which is itself hyperplastic. The retinitis proliferans may at first stand in some relation to a hemorrhage which is becoming organized, or to a hyperplastic adventitia of the degenerated vessels in the neighborhood, but both Banholzer²² and Goldzieher have reported cases in which the proliferation of Müller's fibres appeared to be the principal change.

CASE 2.—S. L., aged fifty years, was admitted to the hospital July 13, 1893, with the diagnosis albuminuric neuro-retinitis. He was healthy until fifteen years before, when he began to have bleeding from the mouth, the origin of which was not determined. For ten years he has been very short of breath. Recently there had been bleeding from the nose also. For three years he has had transient attacks in which he lost consciousness.

He lived in poor circumstances. A diminution of vision in his left eye brought him to the hospital.

St. Pr.—A small man fairly fat, pulse tense, breathing difficult, no œdema, heart sounds normal. Urine: s. g. 1.018, daily quantity 1300 c. c., albumen and hyaline casts present.

Right fundus normal; left, excessive papillitis with large white plaques and hemorrhages about the disc, and plaques and tongue-shaped or punctate hemorrhages about the macula (Pl. C). L.V = movements of the hand.

Therapy: milk diet, warm baths, diaphoresis, and protecting glasses. Under this treatment the albumen and the casts decreased.

August 7th, the patient complained of severe headache on the left side, a pricking in the left eye and ear, and a sensation of pressure and cloudy vision in the left eye. Examination revealed marked circumcorneal injection, a diffuse haziness of the cornea, cloudy media, a pupil of medium size, and tension + 3.

Eserine relieved all the symptoms somewhat, but, August 11th, an iridectomy was made upward which led to considerable hemorrhage. August 14th, the tension was again increased. Slow course of healing. The anterior chamber was not restored until a week after the operation, atropine 2% having been instilled once. This broke up the synechiæ in part and did not cause a relapse. Milk diet and eserine were continued. Later the eye became hard and painful and all vision was lost. October 18th, the eye was enucleated, no anæsthetic being used because of the marked arterio-sclerosis. The patient being very restless, the entire optic nerve with the papilla remained in the orbit, and the lens and vitreous were lost. The healing was uneventful. In June, 1894, the patient died of nephritis but no autopsy was made.

Microscopic Examination.—On account of the absence of some portions of the eye, the changes found will be described but briefly. The hardening, staining, etc. were as in Case 1.

The corneal epithelium is partly detached from Bowman's membrane and the basal cells are oblique. Schlemm's canal is of varying width, being wholly obliterated where the iris had healed into the scar. The iris rested on the ligamentum pectinatum and cornea for a distance of 1.62 mm. Its anterior surface is incompletely covered with a cellular exudation which is neither vascular nor fully organized. There are many foci of leucocytic infiltration in the iris, causing a considerable thickening.

The posterior chamber and the folds between the ciliary processes are filled with a network of fibrin containing large cells and red blood corpuscles.

In the choroid the vessels are all distended with blood, and here, as in the iris and ciliary body, there are many foci of leucocytes.

The retina is folded and detached and exhibits marked pathological changes. The most striking change is the presence of hemorrhages throughout all the layers of the retina. The inner layers are extensively disorganized, the ganglion cells and nerve fibres being degenerated and Müller's fibres hypertrophied, while many empty spaces indicate œdema. The nuclear layers are thickened and the rods and cones broken down.

The vascular changes are very marked. The vessels generally exhibit a chronic degeneration which is due to the general condition of the patient. The degeneration is furthest advanced in the arteries of large and medium calibre, the walls in some places consisting merely of hyaline tubes, while at other points irregular thickenings of the intima partly occlude the lumen.

The veins are large and distended with blood, and pathological changes are not evident.

The arteries of the choroid, ciliary body, and iris were more or less degenerated. The posterior and long ciliary arteries were thickened, and in some of the vortex veins the intima had proliferated.

REMARKS ON CASE II.

The unilateral appearance of albuminuric retinitis due to chronic nephritis is rare even when without complications. Yoert⁴⁴ described such a case in a patient who had but one kidney, which was affected with chronic parenchymatous nephritis. Schlesinger¹⁷ reports a case that was under observation for two and a half years, Cheatham⁴⁵ reports two, Bull⁴⁶ ten cases, and Eales⁴⁷ one case.

Acute glaucoma following non-albuminuric neuritis or papillitis has been occasionally seen (Webster and Brailey,⁴⁸ Rampoldi,⁴⁹ and Mauro⁵⁰).

The vascular changes have transformed the spongy structure of the iris into a fibrous structure as in Case 1. The ciliary body and choroid were in a state of chronic inflammation and contained many hemorrhages. All the layers of the thickened and œdematous retina were pervaded with hemorrhages—an expression of the advanced vascular degeneration. The nerve-fibre layer was atrophic and the supporting tissue hypertrophic. The pigment epithelium had undergone proliferation, and the rods and cones were degenerated.

The entire vascular system was in a state of advanced degeneration—a simple endarteritis chronica deformans, which is a frequent accompaniment of nephritic disease.

The two cases here described had in common pronounced degenerative changes in the vessel walls, which led, through partial thromboses, to hemorrhages in the retina and vitreous, followed by hemorrhagic glaucoma with closure of the chamber angle, atrophy of the iris, and endophlebitic processes in the venæ vorticosæ. In the first case, which was more advanced, the vascular degeneration assumed a more active character, giving rise to a proliferation of connective tissue in the retina and in the vitreous (retinitis proliferans). In the second case, on the contrary, the degenerative changes in the vessels were of a more passive character, the cellular proliferations acquiring only a limited extent before undergoing hyaline degeneration.

The genesis of hemorrhagic glaucoma has in recent times been brought into connection with thrombosis, particularly of the central vein (Purtscher, Marple, Fridenberg,⁵⁸ Weinbaum,⁵⁹ and Schnabel). In both of our cases there was thrombosis, but not of the central vein.

CONCLUSIONS.

1. It is known and also confirmed by the present investigation that kidney disease may cause changes in the vessel walls, which in their turn may lead to nutritive disturbances in tissues like the retina and there be objectively recognized.
2. Frequently kidney disease with albuminuria may exist without causing lesions in the retina.

3. It is proven that in a number of cases the ocular changes caused by kidney disease become complicated with symptoms of acute glaucoma.

4. It is therefore advisable in cases of glaucoma, even when retinal changes are wanting, to bear in mind the possibility of kidney disease.

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Explanation of the Figures.

Plate A, represents the beginning of the albuminuric neuro-retinitis with peripheric hemorrhages and disease of an artery running horizontally to the nasal side. (Left eye. Case 1.)

Plate B, represents a connective-tissue development in the vitreous, eight months later, proceeding from the vascular changes mentioned above. (Left eye. Case 1.)

Plate C, represents the pronounced neuro-retinitis of the left eye in Case 2.

Plate D, FIG. 1, represents a section through the degenerated retina *b*, with organized hemorrhages *c*, proliferation of the pigment epithelium *d*, endarteritis 8, periarteritis of a large vessel 9, new connective tissue in the vitreous *a*, which contains large vessels 7 and capillaries 10, and has a stratified structure 1 and 2. Zeiss obj. A. Oc. III.

Plate D, FIG. 2, exhibits two organized hemorrhages in the fovea beneath the unchanged pigment epithelium. Zeiss obj. A. Oc. III.

CLINICAL REPORTS OF TWO CASES.

By V. L. RAIK, M.D., PROVIDENCE, R. I.

I. Extreme Deviation upward and outward of the Right Eye, with Nystagmus of the Left.

II. Transparent Floor of an Ulcer on a Large Leucoma of the Cornea.

I. G.C. Polish, twenty-three years of age, robust, healthy, and intelligent, with a family history not sufficiently clear to be of any avail, came to the Rhode Island Hospital in the winter of 1898 to see if anything could be done for an anomaly of his eyes, which had afflicted him as far back as he can remember. The patient showed a deviation upward and outward of the right eye and horizontal nystagmus of the left. The excursions of this latter were normal and free in all directions, pupillary reaction good, media transparent, color perception and field of vision normal, vision 0.9 with 0.50 D Hm. The right eye gave a peculiar appearance to the patient when he looked straight forward, only the white of the sclerotic being visible in the palpebral aperture. The cornea was completely hidden under the upper lid, and remained so even under the strongest efforts of the patient to look downward. Raising forcibly the superior lid, only the lower margin of the cornea could be seen, while a fixation forceps applied near the sclero-corneal junction did not materially move the eyeball from its abnormal position.

Cases of spasmodic deviation upward have been reported, but a permanent one in such a high degree as in our case, accompanied by nystagmus of the other eye, must be very rare, I having been unable to find any other in the medical literature of the subject. The troubles of both eyes were permanent, the patient having been under my observation

for about two months with the same abnormal manifestations.

It is generally admitted that vertical deviation is either due to paralysis of the depressors or levators, or to congenital absence of the muscles. In the present case I would exclude any congenital absence or abnormal implantation of the muscles in consideration of the nystagmus, which I consider not an independent disturbance, but etiologically associated with the trouble of the right eye. Nystagmus in general may be classified as *optic* and *neuropathic*, the former being the consequence of visual defects, the latter the result of central alterations. The left eye, as it appears from the history, is anatomically and physiologically normal and its trouble cannot but be neuropathic. The most plausible hypothesis then is that the deviation of the right eye is of the same nature. A central, localized disease has produced paralysis of the depressors and adductor (inferior rectus, superior oblique, internal rectus), followed by permanent contractures of the antagonists. A spasm of the levators and abductor (superior rectus, inferior oblique, external rectus) is out of the question, the trouble being not intermittent but permanent.

Considering the muscles that are affected and the absence of other brain symptoms, I deduce that the paralysis is of nuclear origin. In fact the partial nuclei of the internal rectus, inferior rectus, and that of the superior oblique are grouped together on the floor of the aqueduct of Sylvius, and it is easy to understand how an alteration might localize itself to these particular nuclei, leaving the others intact.

Although the pathology and etiology of nystagmus have not been sufficiently elucidated, Raehlmann and Charcot have proved that in some cases lesions of the fourth ventricle can produce it. Under such considerations then it is not improbable that both paralysis of the external muscles of the right eye and nystagmus of the left are the effect of the same cause—a localized, congenital disturbance on the floor of the fourth ventricle.

II. G. G., aged twenty-seven, Italian, four months previous to my first examination had gonorrhœal ophthalmia, for which he had

been once or twice to a dispensary in New York, afterwards taking no care whatever of his eyes. An ulceration of the cornea had taken place, leaving an extensive leucoma. The disfigurement of the eye becoming more evident every day decided him at last to consult a physician, and he came to me. At that time there was no secretion from the conjunctiva, all symptoms of inflammation gone, and on the cornea of the right eye a large leucoma of an irregular form was visible, leaving only the margin of the membrane transparent. On a line coinciding with the vertical meridian of the cornea there were two round ulcers, one above and the other below its centre, of which the former was smaller, opaque, and the latter larger (2 mm diam.), with a perfectly transparent floor. For three months that the patient remained under my observation the transparency remained stationary, and gave the appearance of a diminutive cornea implanted on the white scar. The floor of this ulcer, though somewhat convex, never, under the intraocular pressure, as is the ordinary case with keratocele, reached the level of the anterior surface of the cornea. Under artificial illumination, although the pupil could not be seen, the ulcer being small and eccentric, the iris appeared distinct in the lower part, free from adhesions to the cornea, and the anterior chamber of normal depth,—a fact which excludes the idea of corneal perforation.

Evidently in this case the stroma of the cornea had been destroyed throughout its entire thickness by the ulceration, leaving only the Descemet membrane intact, and when the reparative process had become complete a new ulcer had started, stopping its destructive effect at the deeper transparent structure.

Ulcers with transparent base, remaining as such for a long time, due to the great resistance of the Descemet membrane to inflammatory necrobiotic processes, are not rare, but a similar affection taking place on a recent, well formed leucoma with such peculiar characteristics cannot be common. It would have been interesting, if the ulcer, instead of being eccentric, with no qualitative light-perception to the patient, had been in the centre of the cornea, to note the amount of vision and the refraction of the affected eye.

THE PALPEBRAL REACTION OF THE PUPIL— (GALASSI).

BY H. GIFFORD, M.D., OMAHA, NEB.

THE pupillary reaction which I described in these ARCHIVES, June, 1895, as an orbicularis pupil-reaction has since been rediscovered by Westphal¹ and apparently also by Piltz,² who while mentioning my article claims the priority of the discovery for Wundt. This claim, however, is incorrect and is evidently made from a misconception of Wundt's language. That the reader may judge for himself I quote in full the passage referred to by Piltz: "Light stimulus regularly causes a double reflex: first, a closing of the eyelids with a turning of both eyes inwards and upwards; and, second, contraction of the pupil; both reflexes are bilateral, although when the stimulus is slight the movement is most marked on the stimulated side."³ It is evident that the contraction of the pupil here referred to is simply the ordinary light-reaction, while in a foot-note to this sentence there occurs the following: "The closing of the eyelids is a reflex of the light stimulus to the facial; the contraction of the pupil and the rolling of the eye up and in, a reflex to the oculo-motor. All of these movements are at the same time instances of co-movement (Mitbewegung). When, for instance, we close the eye voluntarily, we at the same time turn the ball up and in; and when we make the latter movement then the pupil contracts at the same time." This plainly does not refer to the orbicularis contraction but to that which

¹ Westphal, *Neurologisches Centralblatt*, 1899, 4.

² Piltz, *ibid.*, 1899, 6.

³ Wundt, *Grundzüge d. physiologischen Psychologie*, 1880, p. 172.

occurs when the eyes are turned up and in, and this is probably nothing but the convergence contraction. But having dismissed this claim of Piltz for Wundt, I can not do the same with that put forward by Mingazzini¹ for Galassi, for on looking up the references given by M. I find that Galassi described what I have called the orbicularis reaction not only before I described it in 1895 but before I had observed it in 1888. On June 11, 1887, Galassi² reported that he had observed a new pupil reflex in two women with oculo-motor paralysis. One of these, whom he exhibited to the society, had slightly dilated pupils, immovable to light and convergence stimuli, but if the patient closed the eyes firmly, while the right pupil remained immovable the left contracted sharply and dilated again when the orbicularis ceased its action. This led Bastianelli to examine the eyes of healthy people and he and Galassi found that often, if not always, a similar reflex could be observed in health. Then G. adds: "The experiment is difficult from the fact that, in health, the closure of the lids is accompanied by a rotation of the globe upwards by which the pupil is concealed from the observer. But if one makes the experiment with a person who can control this movement, one succeeds in most cases in seeing a contraction of the pupil which accompanies the effort of the orbicularis." He suggests that some cases of so-called perverse or paradoxical pupil-reaction are nothing more than this dilatation which occurs when the orbicularis ceases contraction.

In his second communication, G.* gives the history of a woman with right-sided unilateral oculo-motor paralysis, in whose right eye the light, convergence and accommodation reactions were absent, but who showed an exaggeration of the orbicularis reaction. She died soon after, and an examination of the third nerves showed a degenerative neuritis of the extradural portion of the right one, probably from the pressure of a slight exostosis at the base of the cranial cavity.

¹ Mingazzini, *Neurologisches Centralblatt*, 1899, 11.

² Galassi, *Bulletino della Soc. Lancis. degli Ospedali di Roma*, Anno vii., Fasc. iv., Seduta del 11 Giugno, 1887.

*Galassi, *ibid.*, Anno viii., Fasc. ii., p. 81.

To explain why this reaction may exist when all the ordinary pupil reflexes are gone, G. suggests that with the partly degenerated nerve it takes more of a stimulus than the ordinary reflexes furnish to overcome its resistance, and that this stimulus is furnished by the voluntary associate movement of the lids. To explain the exaggeration of the orbicularis reflex in this case, he supposes that from the condition of the nerves the sphincter was in a state of abnormal irritability, so that when the stimulus did reach it the muscle responded with an unusually sharp contraction. This he says actually takes place in some cases of paresis of the third nerve when the electric current is used ; he regards it as a reaction of degeneration. The fact that this reflex may persist with peripheral lesions of the third nerve, when all other pupil reflexes are gone, may be used, he thinks, to differentiate between central and peripheral lesions. Galassi calls this reflex the palpebral reaction of the pupil, and as it may be a question whether "orbicularis reaction" is a better name for it, it seems to me that the former is the name it should go by ; or, for short, the lid reaction.

In the article of Piltz above referred to, he describes as something new and distinct from the lid reaction a dilatation of the pupil which occurs after the lids have been closed firmly and then suddenly opened. This, it seems to me, is making two bites of a cherry. When the lid reflex is marked, the contraction of the pupil which occurs when the lids are closed tightly naturally gives place to a dilatation as soon as the contraction of the orbicularis ceases. This was indicated in my paper where, on page 396, I say : " Sometimes (when the lids are held forcibly open while the patient tries to close them) the eyes are rolled up so far that the pupil is not visible while the contraction of the orbicularis is going on, but as soon as the latter is relaxed and the pupils come down into view, they are seen for an instant to be contracted, though they dilate again promptly to the average or more than average size ; " and for years before and since this paper was published I have been accustomed to illustrate the lid reaction by having the observer note that when the lids were opened, after a forcible closure, the pupil in many

cases dilates instead of contracting. This was also noted before me by Galassi, who was led by it to his conclusion that the so-called paradoxical reaction of the pupil was, in some cases, nothing more than a dilatation following a well marked lid reaction.

The only point of importance with regard to this reaction in which Galassi had not already anticipated me is the fact that although it is a reaction from the facial, it does not depend upon the reaction of all the fibres of the orbicularis, but chiefly or entirely upon the action of those which move the lids or perhaps simply the upper lid alone. Those parts of the orbicularis which pull down the eyebrow and pull up the cheek can be contracted with the utmost energy without having any effect upon the pupil, the contraction of which occurs most distinctly if the subject can direct his entire attention to contracting the strictly palpebral portions of the muscle. The difficulty which many people experience in doing this without practice accounts, in my opinion, for the impossibility of demonstrating the lid reaction in a certain proportion of normal eyes. Such subjects, when told to close the lids firmly, expend nearly all their energy in contracting the more peripheral (reckoning from the lid fissure as a centre) portions of the orbicularis, with little if any action of the lid portions of the muscle. Thus in the last 115 normal subjects whom I have tested for the lid reaction, I have been unable to demonstrate it in 16 cases, or about 13.8 %, and in all these cases it was impossible to get the subject to contract the lid portion of the orbicularis strongly.

If, as I have already suggested, the lid reaction of the pupil is explained by the fact demonstrated by Mendel in rabbits, that the orbicularis fibres of the facial arise, not from the common facial muscles but from the posterior part of the oculo-motor muscles, the facts just mentioned indicate that in man at least, it is only those fibres of the facial which supply the strictly palpebral portions of the orbicularis which have this oculo-motor origin. I have recently ascertained another fact which strongly indicates a separate origin for the different parts of the orbicularis muscle. It

has long been known that by forcibly closing the lids, many or perhaps all people can produce a rumbling or fluttering sensation in the ears, dependent upon a contraction of the stapedius muscle. I find that in my own case and in that of others whom I can get to perform the experiment intelligently, this noise can be produced only by contracting the strictly palpebral fibres of the orbicularis. The outlying fibres of the muscle can be contracted to the utmost without producing any sensation in the ears; but the instant the lid portions are brought strongly into action the rumbling begins.

Any one interested in this reaction can find a discussion of a few minor points, which I do not care to repeat here, in my former paper.

REPORT OF THE MEETING OF THE SECTION ON
OPHTHALMOLOGY AND OTOTOLOGY OF THE NEW
YORK ACADEMY OF MEDICINE, HELD MONDAY
EVENING, JANUARY 15, 1900.

BY DR. J. H. CLAIBORNE, SECRETARY.

Dr. Peter A. Callan, Chairman of the Section, and Dr. J. Herbert Claiborne, Secretary, were reelected for the ensuing year.

Dr. ARTHUR N. ALLING presented **a case of eyelash in the anterior chamber.** There had been an injury of the cornea of the left eye, resulting in leucoma adherens. There was also an injury of the lens. The eyelash could be seen distinctly in the anterior chamber attached to the leucoma. Dr. Alling thought the eyelash should be removed, and asked the opinion of those present.

Dr. JOHNSON referred to a case in which there had been a hair in the anterior chamber after injury to the lens. There had been no irritation. Cases were also referred to by gentlemen present in which bristles of a hair-brush had been driven into the anterior chamber. One case had been observed for three years and the eye was still quiet. Dr. CALLAN referred to a case in which a stone remained in the anterior chamber for twenty-five years. He thought the anterior chamber was quite tolerant of foreign bodies. In the case presented he thought the eyelash might be removed.

Dr. PERCY FRIDENBERG demonstrated an instrument for testing simulated monocular blindness in malingerers. The instrument consisted of test-frames mounted upon a handle to which tilting mirrors were attached. The principle of the instrument consisted in deceiving the patient so that while he thought he saw with one eye he in reality saw with the other. The instrument was cleverly constructed.

Dr. DUANE referred to a method by which the test might be

made without any apparatus, through the medium of red and black letters written on white paper and viewed with a red glass before one eye.

Dr. Fridenberg closed the discussion.

Dr. J. WILLIAM ATKINSON detailed a case of **sarcoma of the base of the brain involving the optic chiasm** in which there was a history of polyuria for three years; partial paralysis of the third nerve appeared in the right eye, and also diminished vision in both eyes. There was also a mild degree of optic neuritis in both eyes. The visual field began to contract from the temporal side, first in the right and then in the left eye. The left eye became blind three months and the right eye four months after the patient came under observation. The patient became gradually weaker and passed into a state of coma. He died eleven months after the first observation. Autopsy revealed a tumor in the region of the pituitary body, obliterating the optic chiasm and tracts. The tumor appeared to be a large round-celled sarcoma.

Dr. WILLIAM M. LESZYNSKY presented three **clinical cases illustrating lesions of the optic chiasm**. The clinical features of these cases were well set forth and numerous charts of the visual fields were presented.

A paper was read by Dr. WARD A. HOLDEN on **the sequence of changes in the optic chiasm produced by acromegaly, as exemplified in three cases**.¹

In Case 1, the pituitary body was somewhat enlarged, and the chiasm slightly compressed from behind and below, and the optic tracts from within.

In Case 2, the pituitary body measured 3.3 *cm* in antero-posterior diameter, and 2.7 *cm* in transverse. It nearly filled the space included within the arterial circle of Willis. The atrophied optic nerves, flattened and distorted, emerged from between the pituitary body and the atheromatous anterior cerebral arteries. The only trace of chiasm remaining was a membranous band stretched over the anterior surface of the pituitary body from one optic nerve to the other.

In Case 3, the chiasm was flattened so that it occupied an area 2.5 *cm* square. The central portion, while not entirely atrophic, was greatly compressed, and was forced up against the base of the

¹ To appear, with illustrations, in the *Archives of Neurology and Psychopathology*, vol. ii., No. 3.

brain, while each optic nerve appeared to be continuous with the optic tract of the same side only. An atrophic process extended inward from each optic nerve, representing the anterior portion of the chiasm which had been cut through. The bony pituitary fossa was enormously enlarged, the anterior wall being pushed forward nearly to the line connecting the optic foramina.

Normally the anterior portion of the chiasm lies above the olivary process of the sphenoid bone. The infundibulum of the pituitary body passes down behind the chiasm and expands into the body proper, which fills the pituitary fossa, lying beneath the posterior portion of the chiasm. While the other relations remain normal, the upward pressure of an enlarged pituitary body can affect the chiasm in its posterior portion only. But with the pushing forward of the anterior wall of the fossa which eventually results from the enlargement of the pituitary body, the anterior portion of the chiasm loses the bony floor on which it has rested and then becomes subject to the encroachment of the pituitary body.

From an examination of these three cases it is evident that the gross changes which the chiasm may regularly be expected to undergo in acromegaly are these :

First, the enlarging pituitary body compresses the posterior portion of the chiasm. Following this, the posterior and middle portions of the chiasm are flattened and forced upward, thus becoming separated from the anterior portion, which is protected from pressure by the bone beneath it. Later, with this tilting upward of the chiasm posteriorly and the forcing forward of the anterior wall of the pituitary fossa, the anterior portion of the chiasm is encroached upon by the pituitary body and arched directly forward. Finally, the chiasm may be cut through completely.

The glandular enlargement of the pituitary body in acromegaly always remains within its capsule and never penetrates the chiasm as the malignant tumors of the pituitary body may do. Hence the pressure on the chiasm is diffuse, and the resulting degeneration in the chiasm need not be exactly at the seat of pressure. Furthermore this diffuse pressure may interfere with the function of large portions of the chiasm, but often only slightly, so that the defect in the visual field is not absolute, but for colors only.

There may be considerable variety in the type of contraction of the visual fields. If the pituitary body becomes enlarged

symmetrically, the chiasm will probably be compressed posteriorly and flattened out laterally. With diffuse pressure on the chiasm in its entire lateral extent there will probably be concentric contraction of the visual fields; but if the median portion of the chiasm is the more compressed, as is frequently the case, the crossed fibres in the chiasm will be those most interfered with, and there will result a more or less typical bitemporal hemianopsia.

If, however, one side of the pituitary body enlarges more rapidly than the other, for a time one tract alone may be compressed, causing homonymous hemianopsia.

Again, the atrophy in one optic nerve may differ from that in the other, because one has been pressed against a rigid anterior cerebral artery instead of against the soft brain substance.

Furthermore, Broca believed that the optic nerves might be compressed by narrowing of the optic foramina. In Case 3, the foramina were somewhat contracted, although there was no evidence of pressure upon the nerves, which were slightly atrophied:

Finally, in view of the fact that in acromegaly there are frequently signs of inflammation of the optic nerves, amounting at times to choked disc, the nerve fibres might be compressed as a result of interstitial inflammation. In none of these three cases, however, were microscopic signs of neuritis found.

About 200 cases of acromegaly have been reported. Disturbances of vision were noted in about half of them. In more than 50% of the cases with disturbance of vision there was found concentric contraction of the fields. In somewhat less than 50% there was bitemporal hemianopsia, absolute or for colors only, with or without some contraction of the nasal halves of the fields. In less than a dozen cases there was homonymous hemianopsia, and in one case there was found atypical binasal hemianopsia.

The type of contraction, of course, often changes as the disease progresses.

In the *discussion* of Dr. Holden's paper, Dr. H. KNAPP said that he could not speak on acromegaly, having had no cases of this disease under his care, but he had seen a good many cases of bitemporal hemianopsia. Out of these he would briefly detail three as worthy of particular notice; in two of them an autopsy had revealed sarcoma of the pituitary body.

Sarcoma of the hypophysis cerebri, bitemporal hemianopsia, total blindness; insanity, impotence from rudimentary development of genitals.

CASE 1 was that of a well-built man of twenty-eight years, whom he had first seen in 1870, and who two months previously had noticed impairment of sight in the left eye, and temporary obscuration in both. The temporal half of the field of vision of the left eye was completely absent, cutting off sharply at the vertical meridian. The outer part of the F of the right was absent to a line running from near the vertical meridian obliquely down and outward. Both opd. pale.

May 17, 1871, bitemporal hemianopsia ending at vertical median plane. S R $\frac{2}{4}0$, L $\frac{2}{4}0$.

April 16, 1873. Both opd. atrophic. L S = 0; R temp. hemianopsia, encroaching on the nasal side, below more than above. S $\frac{2}{10}0$. He lived five years longer. His chief complaint were visual hallucinations, the unreality of which he was conscious of, later he believed in their existence. He was drowsy, at times delirious, weak; stools involuntary. He became completely insane. The autopsy, made by Dr. E. G. Seguin, revealed a *tumor of the hypophysis cerebri*.

A peculiar symptom in his case, noticed before the beginning of his impairment of sight until his death, was *impotence* from rudimentary development of his genitals. He was married, but had no children.

CASE 2 has many features in common with the previous one. **Bitemporal hemianopsia, gradually developed, leading to total blindness; well-built, stout woman with an involuted uterus.** She was married. In the fifth month of pregnancy was suddenly attacked with headache and left hemianæsthesia, beginning at the foot and lasting ten minutes. She was very well for a year, when, in winter, coming from the cold into a hot room, she had headache again, and for five minutes her right arm was insensible, not paralyzed. Two years later she had constant headache for some weeks, most in the forehead, next on the vertex, accompanied by dizziness and ringing in the ears. Since then her sight has gradually declined. Her menstruation did not return after her confinement, but she felt no discomfort in her abdomen.

Two years later she went to Germany, where Dr. Biedert discovered bitemporal hemianopsia, not quite reaching the median line in the right eye. She constantly had the sensation of pressure in her forehead.

I saw her first, May 29, 1880, four and one half years after she

had the first attack of hemianæsthesia. I found the complete picture of bitemporal hemianopsia, the limit exactly in the median line. S $L \frac{2}{7} 0$, R $\frac{2}{2} 0 0$. She had the peculiarity that in the blind left temporal half of F there were several small islets in which she could see a white ball 15 mm in diameter, on a black stick. The optic nerves were atrophic. On my advice she was examined by a gynecologist, who reported that she had an involuted uterus.

I saw her last twelve years later, March 5, 1892. She was free from pain, but had been totally blind the last ten years. No cerebral symptoms. Photopsiæ for ten years, phantasms and other cerebral symptoms for two months. Some time ago I heard that she was living, but blind as before.

The diagnosis of enlargement of the pituitary body can safely be admitted. Whether in the previous case, as in this one, and in one of Professor Oppenheimer's, the rudimentary genitals had any relation to the hypophysis disease or not I cannot tell.

Sarcoma of hypophysis, involving the optic chiasm and perforating the vault of the pharynx, temporal hemianopsia.

CASE 3 referred to a girl of twelve years, whom I first saw in May, 1888, with incomplete **optic-nerve atrophy of the left eye**. S $\frac{2}{10} 0$. F contracted on temporal side. Right eye normal. Six months before she came to me she had struck the left side of her forehead against the edge of a door. She had no cerebral symptoms. Her sight gradually weakened.

January 13, 1891, S was R $\frac{2}{5} 0$, L $\frac{2}{2} 0 0$. Right eye color perception absent in temporal half, contracted on nasal side. While taking Ung. Hy. and KI her sight improved, R to $\frac{2}{5} 0$, L to $\frac{2}{10} 0$. Soon, however, it weakened again, and the fields contracted; the limitation in the left advanced considerably from the temporal over to the nasal side.

In March, 1891, F for forms complete, but objects appeared veiled, and colors were not recognized at all on the temporal side of the right eye. Line of demarcation in the vertical meridian. R S $\frac{2}{5} 0$, but cannot count fingers on the temporal side. In July, 1891, she had vomiting and convulsions, which disappeared quickly on bromides. She died August 4, 1891. Shortly before her death there was an escape of liquid through the posterior upper wall of the pharynx. She had been seen and occasionally treated by Drs. C. S. Bull, Hy. D. Noyes, E. C. Seguin, and E. G. Janeway.

At the autopsy I found a tumor (sarcoma) involving the optic chiasm, extending little to the right optic trunk, but considerably to the left. The hypophysis was merged into it. The sphenoidal sinus was perforated in its lower wall. This girl also was of strong build, but showed no conspicuous abnormality.

Whether the rudimentary condition of the genitals in the first two cases had a particular connection with temporal hemianopsia, hypophysis tumors, and acromegaly, I do not know. I have looked up the three cases, described above, in my record books, and desire to say that the last was mentioned by Dr. Noyes and myself at the twenty-seventh annual meeting of the American Ophthalmological Society (September 23, 1891, in Washington, D. C.), in the discussion of a paper by Dr. C. S. Bull, "On Intracranial Lesions, with Defects in the Visual Fields. Five Cases with Autopsies." *Trans. Am. Ophth. Soc.*, vol. vi., p. 268.

Dr. GRUENING referred to the case of a young girl, a student, who had dimness of vision one evening. She exhibited **blindness in the upper temporal quadrant** of the field of the left eye and paracentral scotoma of the right temporal field. She had headache and vomiting. The patient became blind. No marked neuritis.

Dr. JOSEPH COLLINS said that the **ocular symptoms of acromegaly were inconstant and variable, as was the lesion that produced them.** Although it was generally accepted that lesion of the pituitary gland stood in definite causative relationship to acromegaly, there is no unanimity of opinion as to what these changes really are,—they may be tumor formation, simple atrophy, or hypertrophy. In the cases that he had observed and which had come to autopsy there was lesion of the pituitary gland similar to that in the cases related by Dr. Holden.

He referred to Dr. Knapp's observation in regard to atrophy of the genital system in acromegaly. He had observed that in men the genitals were shrunken, while in women the internal genitals were shrunken and the external enlarged. He also referred to a case of psychic trauma, in which there was bitemporal hemianopsia. He thought that what might be called a field characteristic of acromegaly did not necessarily mean lesion of the chiasm. The man spoken of recovered under treatment.

Dr. KNAPP referred to Dr. Leszynsky's cases, and said that he likewise had observed islets of sight in the blind part of the field.

Dr. LESZYNSKY said he thought the fields ought to be taken

carefully. He had seen Dr. Atkinson's case, and had observed that the third nerve was involved on the same side as the lesion. He referred to the absence of neuritis and to the existence of bi-temporal hemianopsia as classical symptoms in this class of cases. He referred to the possibility of these symptoms being caused by benign tumors, and said that it was not easy to make the diagnosis of malignant disease. He had made no inquiry as to the existence of rudimentary genitals.

Dr. HOLDEN, in closing the discussion, referred to the imperfect testing of the fields. He thought the fields should be tested with colors, or with pale-gray test objects.

SYSTEMATIC REPORT ON THE PROGRESS OF
OPHTHALMOLOGY IN THE THIRD
QUARTER OF THE YEAR 1899.

BY DR. ST. BERNHEIMER, IN VIENNA ; DR. O. BRECHT,
PROF. R. GREEFF, PROF. C. HORSTMANN, AND DR.
R. SCHWEIGGER, IN BERLIN ;

WITH THE ASSISTANCE OF

Dr. G. ABELSDORFF, Berlin ; Dr. SWAN M. BURNETT, Washington ; Dr. DALÉN,
Stockholm ; Dr. HERRNHEISER, Prague ; Prof. HIRSCHMANN, Char-
koff ; Dr. KRAHNSTÖVER, Rome ; Dr. P. VON MITTELSTÄDT,
Metz ; Prof. DA GAMA PINTO, Lisbon ; Dr. SULZER,
Paris ; W. J. LISTER, F.R.C.S., England ;
Dr. C. H. A. WESTHOFF,
Amsterdam.

Translated by Dr. WARD A. HOLDEN.

Sections I.-III. Reviewed by PROF. HORSTMANN.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

325. BIRNBACHER. The pathological histology of the human eye. Veit & Co., Leipsic, 1899. First part.

326. BORTHEN, LYDER. Lepra of the eye. Clinical studies with pathological examinations by N. P. Lie. Leipsic, 1899. Engelmann.

327. MAGAVLY. Reports from the St. Petersburg Ophthalmic Institute. Vol vi. In celebration of the seventy-fifth year since the opening of the institute. St. Petersburg and Leipsic, 1899.

328. PERGENS. Leonhard Fuchs's "*Alle Krankheyt der Augen*" (1539), republished. *Centralbl. f. prakt. Augenheilk.*, xxxii., pp 197 and 231.

329. LEWITZKY. Report on the work done in the University Eye Clinic at Kieff in the fifteen years of its existence (1883-1897).

330. MULLEN, JOSEPH A. The percentage of color-blindness to normal color vision as computed from 308,919 cases. *Ophth. Record*, July, 1899.

331. EYE, EAR, NOSE, AND THROAT HOSPITAL OF NEW ORLEANS. Ninth annual report, 1898.

332. NEW YORK EYE AND EAR INFIRMARY REPORT, for the year ending October 1, 1898.

333. BELL, G. H. Summary of operations for cataract done at the New York Eye and Ear Infirmary from October 1, 1897, to October 1, 1898. *New York Eye and Ear Infirmary Report*, Jan., 1899.

The purpose of BIRNBACHER'S (325) work, which will appear in five parts, is to offer to the clinician accurate representations of the histological conditions found in the commoner forms of ocular disease. The first part comprises five plates of heliotype reproductions of photo-micrographs illustrating the diseases of the conjunctiva. These unusually successful reproductions with explanatory text will prove very valuable for personal and classroom instruction.

Borthen (326), having studied lepra in five colonies, gives a comprehensive clinical description of the ocular complications, which is supplemented with pathological studies by Lie. The value of the book is considerably enhanced by the presence of seventeen figures in the text, and fifteen heliotype and nine chromo-lithographic plates, all well executed.

Magavly's (327) book gives a history, with various sorts of data, of the St. Petersburg Ophthalmic Institute. From 1824 to 1898, the number of out-patients was 756,784. The number of operations was 58,570, of which 7263 were for cataract.

HIRSCHMANN.

In Germany the opinion was general that German ophthalmology had its beginning in Bartsch's *Ophthalmodouleia* (1583). Pergens (328) found that L. Fuchs had published in 1539 a small book on the eye which was a German rendering of his *Tabula Oculorum Morbos Comprehendens* (1538, Tübingen). A résumé of its contents is presented in Pergens's paper.

The total number of out-patients treated in the clinic at Kieff

(329) was 34,060, with 2052 operations. The in-patients numbered 2532, and 2385 operations were done. HIRSCHMANN.

The statistics from which Mullen (330) computed his results were obtained principally from the Naval Departments of the various nations of the world. There were 308,919 men, and among these there was an average of 1.82% color-blind. Among 15,634 women the percentage was 0.01. As to nations, France had the least, 0.01%, and Denmark the highest, 3.80%. The United States had 1.53%, and England, 3.2%. Japan, 3.1%, and China, 3.16%. BURNETT.

In the eye department of the New Orleans Eye, Ear, Nose, and Throat Hospital, (331) under the charge of Dr. H. D. Bruns, there were treated, during 1898, 2356 cases. These cases have been tabulated after the custom of this hospital most carefully, and are a credit to the institution and of great value to the scientific student. We know of no such painstaking work anywhere. There were 25 extractions, 7 discissions, 15 enucleations, 33 iridectomies, 3 for glaucoma, 6 tenotomies, and one advancement. BURNETT.

During the year ending October 1, 1898, there were treated at the New York Eye and Ear Infirmary (332) 24,904 eye diseases. There were 271 operations of all kinds on the lens, 138 on the muscles, 138 on the iris, and 66 on the globe. Specific operation not given. BURNETT.

During the year ending October, 1898, there were made at the New York Eye and Ear Infirmary (333) 178 extractions of cataract. Of these, 90 were senile. The average stay in the hospital was 15.12 days. There were two cases of panophthalmitis, one preceded by hemorrhage into the vitreous. No source of infection for these was found. Intraocular hemorrhage occurred in one case following retinal detachment. There were 66% of simple extractions; 27% with iridectomy; linear, 2.25%. Discission of capsule was made in 18.56% of the cases. The iris prolapsed in 11.28% and generally twenty days after the operation. Ultimate vision $\frac{2}{20}$ or better in 34.13%; $\frac{3}{20}$, 26.82%; $\frac{4}{20}$, 21.95%; $\frac{5}{20}$ 12.19%; $\frac{6}{20}$, and $\frac{7}{20}$, each 2%. These cases are beautifully tabulated. BURNETT.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

334. VAN DUYSE. On congenital anophthalmus. *Arch. d'ophth.*, xix., 7, p. 142.

335. HOPPE. Argyrosis : a clinico-anatomical investigation. *Graefe's Archiv*, xlviii., p. 660.

336. SIEGRIST. The danger to the human eye of ligating the common carotid. *Corr.-Blatt. f. Schweizer Aerzte*, 1899, No. 22.

337. LOBANOFF. The influence of the temperature of liquids on their absorption from the conjunctival sac. *Wratsch*, 1899, No. 35.

338. RICCHI. Bacteriological researches and brief clinical considerations in regard to some cases of lachrymal tumor. *Ann di Ottalm.*, xxviii., 1.

339. PES. Bacteriological note on the bacillus of the Meibomian secretion (Reymond-Collonatti) in its relation to conjunctival affections and its biological affinity with the Klebs-Loeffler bacillus. *Report of the XV. Italian Ophthalmological Congress*, at Turin, 1899.

340. GULLSTRAND. On the meaning of dioptry. *Graefe's Archiv*, xlix., p. 46.

341. GOLDZIEHER. *Ocular Therapeutics* ; 2d revised edition, 1st half. Leipzig : Veit & Co., 1899.

342. HERTEL. The effect of cold and warm applications upon the temperature of the eye. *Graefe's Archiv*, xlix., p. 125.

343. BAJARDI. On the penetration of mercury into the intra-ocular liquids from local applications of mercurial preparations. *Report of the XV. Italian Ophth. Congress*, at Turin, 1899.

344. FAGE. Antiseptic injections and lavage of the anterior chamber. *Arch. d'ophth.*, xix., 7, p. 436.

345. GUTTMANN. On the employment of strong solutions of bichloride in ophthalmic therapy. *Deutsche med. Wochenschr.*, 1899, Therapeutic Supplement No. 11.

346. KOESTER. A statistical clinical report on 773 enucleations of the eyeball. *Inaug. Dissert.*, Tübingen, 1899.

347. HOOR. On the bactericidal and deep action of argenta-min. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 225.

348. MAZZA. A new application of nitrate of silver. *Report of XV. Italian Ophth. Congress*, at Turin, 1899.

349. LANDOLT, H. On the use of extract of suprarenal capsule in ophthalmology. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 321.

350. BARKAN. A further contribution to the extraction of

particles of steel or iron with Haab's large electro-magnet. These ARCHIVES, xxviii., 3, p. 282.

351. DUNN, B. L. Eye strain in its relation to the vertical centration of lenses. *Ibid.*, 5, p. 488.

352. PYLE, WALTER L. Hydrophthalmos: a bibliographical, clinical, and pathological study. *Phila. Monthly Med. Journ.*, April, 1899; also *Annals of Ophth.*, July, 1899.

353. MARSHALL, DEVEREUX. Report of an eye having some congenital peculiarities. *Ophth. Hosp. Reports*, xv., part 1, May, 1899.

In the case reported by VAN DUYSE (334), an infant which died at the age of three months showed no trace of an eye, but the lids were fairly well developed in the vicinity of the lachrymal apparatus. On autopsy it was found that the orbit was normally formed except for an aplasia of the sphenoid bone corresponding to the optic foramen. Anteriorly the orbit was closed by the tarso-orbital fascia covered with conjunctiva, which in its central portion had a depression the size of a pinhead in which the duct of the lachrymal gland opened. There was no trace of a cornea. The eyeballs were reduced to structures 1 mm broad and 5 mm long, united by a fibrous end to the tarso-orbital fascia, and consisted of a fibrous sheath inclosing a choroid separated by pigment cells from a quantity of vessels which filled the cavity. The muscles were inserted into the tarso-orbital fascia. Optic nerve, chiasm, and tracts were completely wanting. The corpora geniculata were barely indicated, and only the posterior pair of the corpora quadrigemina were present. v. MITTELSTÄDT.

HOPPE (335) removed a 6-mm-square piece of conjunctiva and underlying conjunctiva from the lower lid of a patient with argyrosis after two years' use of nitrate of silver. On microscopic examination he found that the greater portion of the pigment was deposited in and among the elastic elements, while an unbroken layer of free pigment lay spread out under the epithelium. It was scattered like fine black dust among the vessels. According to Hoppe's view the pigmentation in argyrosis takes place from the solution having passed into the blood current.

SIEGRIST (336) observed two cases in which ligation of the common carotid led to blindness of the eye on the same side. This blindness came on without inflammatory symptoms, or indeed any manifest external symptoms whatever, but was due to

embolism of the central artery, as was demonstrated anatomically in one case, with or without secondary thrombosis of the ciliary arteries. The visual disturbances are not to be ascribed to the ligation of the carotid *per se*, but are complications due to pathological conditions elsewhere.

LOBANOFF'S (337) investigations were done by the colorimetric method of Bellarminoff, using fluorescein solutions. Higher temperatures (up to 50° C.) favor the passage of fluorescein into the anterior chamber. The increased diffusion (not the osmosis, according to the author's view) stands in fairly constant relation to the increase in temperature. Diminution of temperature diminishes diffusion. Perceptible scaling of epithelium was noticed only when the solutions used were heated above 50° C.

HIRSCHMANN.

After considering the observations of others, RICCHI (338) gives the results of his own examination in 13 cases of suppuration of the lachrymal sac; 21 varieties of micro-organisms were isolated, actinomyces albus being repeatedly found.

KRAHNSTÖVER.

PES (339) does not believe that the Reymond-Collonatti bacillus, commonly known as the xerosis bacillus, is the cause of xerosis, since it is occasionally found in the secretion of the glands at the free margin of the lid, and inoculation usually shows it to be innocent. It is in the class of bacilli similar to the diphtheria bacilli, which, however, differ only functionally from the true diphtheria bacilli.

KRAHNSTÖVER.

The first half of GOLDZIEHER'S (341) valuable work treats of the therapy of the diseases of the conjunctiva, cornea, sclera, iris, and lens.

HERTEL'S (342) experiments showed that the temperature of the conjunctival sac was raised by warm applications and lowered by cold applications in equal measure whether the circulatory relations were normal or not, the resulting temperature depending in no way upon the effect of the applications upon vessels or nerves.

BAJARDI (343) asserts that he has by chemical means demonstrated the presence of mercury in the aqueous humor after application of yellow-oxide salve in the conjunctival sac and after subconjunctival injections of sublimate 1:1000 or even 1:5000.

KRAHNSTÖVER.

FAGE (344) found that injections of 1:5000 oxycyanide of mercury into the anterior chamber of rabbits with keratitis from

inoculation were well borne. He then tried the injection of a solution of half this strength into the anterior chamber of human patients with hypopyon keratitis. The hypopyon soon disappeared and also the pain and symptoms of irritation, while the ulcer slowly improved and cauterization was not required. When there is excessive hypopyon and panophthalmitis threatens, the author, like St. Yves, advises washing out the anterior chamber.

V. MITTELSTÄDT.

GUTTMANN (345) obtained good results in acute conjunctival catarrh, trachoma, and blennorrhœa of the lachrymal sac by instilling 1:300 bichloride solution.

The 773 enucleations done in the Tübingen eye clinic were, according to KÖSTER (346), 53 for malignant tumors, 1 for cysticercus, 74 for glaucoma or hydrophthalmus, 3 for intraocular hemorrhage, 447 for injury, 5 for panophthalmitis, 45 for secondary glaucoma, 49 for irido-cyclitis, 50 for staphyloma, 33 for phthisis bulbi, 2 for Basedow's disease, and 1 for lagophthalmus.

According to HOOR (347), argentamin has marked bactericidal properties and in this respect is more valuable than nitrate of silver. Furthermore it passes more deeply into the tissues and also contracts the vessels. A 5-10% solution is well borne by the eye, which cannot be said of silver.

MAZZA (348) reports favorable results from the use of $\frac{1}{4}$ to $\frac{1}{2}$ % nitrate of silver in cases of deep corneal ulcer with much secretion, when the resulting scar need not be taken into consideration.

H. LANDOLT (349) commends the use of extract of suprarenal capsule in operations in order to diminish hemorrhage, and as an adjuvant to cocaine, atropine, eserine, and the like, in cases of inflammation, to reduce the irritation.

In BARKAN'S (350) 12 cases of magnet extraction the eye was saved in 8, 4 retaining good vision, and 4 more or less useful vision. According to Barkan, the Haab magnet accomplishes all that can be obtained with the small magnet: it does not injure the vitreous and lead to infection, and it is a good sideroscope.

ABELSDORFF.

DUNN (351) finds that asthenopia in patients wearing glasses of different strengths may be due to looking through the lower portion of the glasses and thus obtaining unequal prismatic or astigmatic effects in the two eyes. Proper decentring downward relieves the symptoms.

ABELSDORFF.

PYLE (352) in this paper gives a thorough study of the

hydrophthalmic condition, in addition to a full report of three cases of his own, including two pathological examinations. A most exhaustive bibliography of 106 titles is appended. From this study he concludes that all cases of hydrophthalmos can be divided into two classes. 1. True hydrophthalmos depending upon congenital defective development of the cornea, iris, or filtration channels. 2. Those secondary to fatal intraocular inflammations, usually in the form of irido-keratitis or irido-cyclitis, and keratitis causing closure of the iris angle and filtration channels. The treatment should be myotics, iodides, and mercurials, repeated paracentesis, and, these failing, a broad iridectomy. The prognosis is better than is generally believed. BURNETT.

MARSHALL'S (353) specimen showed a coloboma of the iris and a large coloboma of the choroid, with which was associated an extensive detachment of the retina. Sections through the coloboma showed that the retina was continuous over this area and was adherent to the thin and bulged sclerotic, though elsewhere detached.

On separating the iris, ciliary body, and choroid from the cornea and sclerotic, a peculiar band of tissue was seen running from the coloboma of the iris to the apex of the choroidal coloboma. Microscopic sections showed that this band consisted of ciliary processes which had become fused.

Owing to old inflammatory changes and degeneration of the lens, nothing definite could be made out with regard to its structure or that of the suspensory ligament.

III.—INSTRUMENTS AND REMEDIES.

354. EMMERT. Protargol, a new preparation of silver. *Corr. Bl. f. Schw. Aerzte*, 1899, No. 19.

355. MAZZALI. On the use of protargol in ophthalmology. *Report of the XV. Italian Ophthalmological Congress*, Turin, 1899.

356. HILBERT. The effect of tropococaine in anæsthetizing the cornea and conjunctiva. *Tübingen*, J. Pietzker, 1899.

357. KNAPP, H. Note on the use of euphthalmine. *These ARCHIVES*, xxviii., 3, p. 313.

358. PRETORI. On the treatment of some eye diseases with largin. *Wochenschr. f. Ther. u. Hygiene d. Auges*, ii., No. 44.

359. SELENKOWSKI. On the improvement of our yellow salve. *Wratsch*, 1899, No. 15.

360. WOLFFBERG. Lymph stasis in the eye produced by diosmin, a new observation of physiological and therapeutical interest. *Wochenschr. f. Ther. u. Hyg. d. Auges*, iii., No. 1.

361. LANDOLT. New opto-types for determining the acuteness of vision. *Arch. d'opht.*, xix., 8, p. 465.

362. NEUSTÄTTER. A new optometer skiascope for the subjective and objective determination of refraction, astigmatism, and direction of the principal meridians. *Münch. med. Wochenschr.*, 1899, No. 3.

363. CLUZET. A new procedure for determining the degree of ametropia. *Arch. d'opht.*, xix., 8, p. 492.

364. DIXON. On photographing macroscopical eye specimens. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1899.

365. EATON. Two new instruments for measuring the monocular field of fixation. *Ophth. Record*, Aug., 1899.

366. JACKSON. The mydriatic effect of euphthalmin. *Ibid.*, July, 1899.

367. JOHNSON, J. S. Nitric acid as a cautery in corneal ulcers. *Am. Jour. of Ophth.*, July, 1899.

EMMERT (354) uses protargol in 1-3 per cent. solution two or three times daily in catarrhal conjunctivitis and blennorrhœa. It is also of value in phlyctenulæ, spring catarrh, and follicular conjunctivitis. In 5-20 per cent. ointment it is useful in eczematous keratitis, mycotic inflammations of the cornea, blepharitis ciliaris, and herpes pustules of the lids. Dacryocystic blennorrhœa is cured rapidly by injections of 5-10 per cent. solution.

As a local anæsthetic, HILBERT (356) prefers tropococaine to cocaine since it does not render the corneal epithelium opaque, does not increase tension, nor dilate the pupil. It has some antiseptic properties and is but slightly toxic. It is best used in 5 per cent. solution.

KNAPP (357) regards euphthalmine as the best mydriatic for ophthalmoscopic purposes. It has the advantage of not irritating the skin or conjunctiva and therefore can be used with patients who have an idiosyncrasy against atropine. ABELSDORFF.

Largin is, as PRETORI (358) reports, adapted to take the place of nitrate of silver in many cases since it acts as well and as

quickly, and is less dangerous and painful, and therefore can be used without special precautions.

A series of experiments convinced SELENKOWSKI (359) that freshly prepared oxide of mercury that had not been fully dried was less disposed to form lumps than that in the market which was dried by heat, that it was less affected by the action of light, that it could be more uniformly rubbed up in vaselin without previously being mixed with an oil, and that the salve was not so readily decomposed by the fatty acids. The best vehicle is white vaselin.

HIRSCHMANN.

Dionin is the hydrochlorate of the mono-ethyl-ether of morphine and is very soluble. WOLFFBERG (360) uses it in the form of 10-25 per cent. dionin-cacao pastilles. At first there is watery oedema of the lid margins and chemosis, but this passes off in two or three hours. The process of recovery in fascicular keratitis, perforating injuries, and corneal ulcers is hastened by dionin.

LANDOLT (361) again calls attention to his test of visual acuteness which is based on the determination of the smallest angle under which two points may be recognized as separate. On his chart are fifteen circles of various diameter and thickness of line, each broken at one point which the patient is required to locate. The distance at which the normal eye can recognize the break is indicated for each circle.

V. MITTELSTÄDT.

In CLUZET'S (363) instrument for determining refraction the distance of the inverted image from a lens close to the eye is measured. At one end of a horizontal rod is a convex lens of 15 D which is brought close to the cornea. On the rod is a movable glass plate engraved with vertical lines 1 mm apart. The eye is illuminated with an ophthalmoscope, and the inverted image of a well-marked point like the bifurcation of a vessel is made to cover one of the vertical lines in the glass plate. The observer then moves slightly to the side and observes whether the image still covers the line. If it does, the eye is emmetropic; if the image moves, but less than the line, there is myopia; if more, there is hyperopia. The disc is now shifted until the image covers the line and a scale on the rod indicates the degree of ametropia.

DIXON (364) describes and illustrates in this article a method for photographing specimens after they are mounted in glycerine jelly in glass cups. The difficulty has been to get rid of the reflection of the light from the glass covers. He has accomplished this by the use of tubes and other appliances which are

too technical to abstract. The specimens printed show how successful the effort has been.

BURNETT.

The first of the instruments presented by EATON (365) is a modification of his reflecting tropometer described in the *Ophthalmic Record* for Sept., 1898. This consists mainly in an appliance for fixing it firmly to the head. The other instrument is used for the same purpose, but can with difficulty be described intelligently without diagrams. The principle, however, lies in causing each eye to look through a tube at the end of which is attached an arc, with a radius of 27.5 centimetres, with its centre in the eye. On this the measurements are made and recorded.

BURNETT.

JACKSON (366) thinks that euphthalmin is, for certain uses, superior to any other single mydriatic. This is where a strong dilatation of the pupil is required for diagnostic purposes, and which will pass away rapidly. Its influence upon the accommodation is slight. He thinks its combination with cocaine useful in solutions of 1 % each.

BURNETT.

JOHNSON (367) has used nitric acid as a cauterizer in corneal ulcers for some years with much satisfaction. He employs a solution of the pure acid varying from 9 to 15 % in water. The application, after cocainization, is made with a piece of soft wood, its effects being carefully watched.

BURNETT.

Sections IV.-VII. Reviewed by DR. BERNHEIMER, VIENNA.

IV.—ANATOMY.

368. DIMMER. On the optic-nerve tracts. *Graefe's Archiv*, xlviii., 3.

369. ISCHREYT. On the course of the fibre bundles in the human sclera. *Ibid.*, p. 506.

370. COLLINS, TREACHER. A note on the elastic tissues of the eyeball, as shown by sections stained with acid orcein. *Ophth. Hosp. Reports*, xv., part 1.

DIMMER (368) was the first to be able to follow in man the degeneration of the optic-nerve fibres up to the primary optic-nerve ganglion by means of the Marchi osmic-acid staining method. This method demonstrates absolutely the semidecussation in the human chiasm, and gives us information in regard to the location of the crossed and uncrossed bundles in the optic

nerves, chiasm, and tracts. The degenerated nerve-fibres entered the external geniculate body, the crossed bundles chiefly going to the ventral medulla, and the uncrossed more to the centre of the ganglion.

There was slight degeneration in the arm of the anterior corpus quadrigeminum. In the pulvinar there was a slight degeneration, particularly in the portions which lay near the arm of the anterior corpus quadrigeminum. In the internal geniculate, the posterior quadrigeminal, and in the corpus Luys no changes were found.

Examination of the optic-nerve stump by Weigert's method showed many unchanged fibres. In man, either six weeks is not long enough to produce complete degeneration of all the fibres, or the unchanged fibres are to be regarded as more resistant pupillary fibres or as centrifugal fibres arising in the anterior corpora quadrigemina.

ISCHREY (369) cut out 107 strips from the scleræ of 5 human eyes and examined them. In the anterior half of the sclera, excepting the portion near the limbus, there are two chief directions in which the slightly wavy bundles run. About the equator and at the points of insertion of the muscles the arrangement is more complicated.

The method of staining elastic tissue with acid orcein was introduced by Unna. By its means, according to COLLINS (370), elastic tissue is stained a brown color, whereas the surrounding tissue stains a dull pink. In the sections of the *cornea*, Descemet's membrane stains deeply, and the ligamentum pectinatum into which it divides can be traced into the sclerotic some way beyond the space of Fontana, extending ultimately through about half the width of the sclerotic. Bowman's membrane, on the other hand, stains a dull pink, precisely as the substantia propria, which is additional evidence of its differing in nature from Descemet's membrane. In the *sclerotic*, a number of fine fibres are picked out, and these are more numerous in the outer layers and at the back of the eye, while around the optic nerve there is a dense plexus. The lamina cribrosa is largely composed of elastic fibres, and from it a delicate network extends backwards round the central blood-vessels of the optic nerve.

The elastic tissue in the blood-vessels in all parts of the eye is picked out and in the *iris* there is no other elastic tissue found. In the *choroid* and *ciliary body* the membrane of Bruch stains deeply; and in the *lens* the capsule stains a reddish brown as

opposed to the dull pink of the lens fibres. The fibres of the *suspensory ligament* also stain more deeply than the surrounding tissues.

Other elastic tissue is found in the dural and pial sheaths of the nerve, in the tendons of the recti, and in the sheath around the muscles; also in the conjunctiva between the epithelium and the sclerotic.

V—PHYSIOLOGY.

371. FUMAGALLI. On the minute anatomy of the third eyelid. *Report of the XV. Italian Ophth. Congress*, Milan, 1899.

372. THORNER. A new fixed ophthalmoscope, giving an image free from reflexes. *Zeitschr. f. Psych. u. Phys. d. Sinnesorgane*, xx., 4-5, p. 294.

373. ORSCHANSKY. A method of studying ocular movements directly (ophthalmography). *Centralbl. f. Physiol.*, xii., No. 24.

374. MICHEL. The effect of cold upon the refractive media of the eye. From "Contributions to Physiology," *Festschrift for the Seventieth Birthday of Professor Fick*.

375. TURK. Investigations on the origin of the physiological pulsation of the retinal veins. *Graefe's Archiv*, xlviii., 3, p. 513.

376. BERNHEIMER. Experimental studies on the paths for the synergetic movements of the eyes in monkeys and the relations of the corpora quadrigemina to these paths. *Report of the Academy of Sciences of Vienna, Naturw.-math. Classe*, cviii., 3, May, 1899.

377. PERGENS. On the processes in the retina when illuminated by different colored lights of equal intensity. *Zeitschr. f. Augenheilk.*, i., 2.

378. PRENTICE, CHALMERS. Evolution of the lines of sight. *Lancet*, 1899, p. 1629.

379. PERCIVAL. Relation between visual acuity and efficiency. *Ophth. Review*, Aug., 1899, p. 211.

380. NORTON, C. E. Seeing capillary circulation in one's own retina. *Four. Amer. Med. Assoc.*, July 15, 1899.

381. STILLSON, H. The subjectoscope. *Ibid.*, July 8, 1899.

382. BARNES. The crisis in binocular vision. *Annals of Ophth.*, July, 1899.

FUMAGALLI'S (371) investigations were in regard to the so-called third lid of the rabbit, dove, and hen, taking up the anatomical structure of the organ, particularly with reference to the nerve endings as revealed by the Golgi method.

KRAHNSTÖVER.

THORNER (372) has devised an instrument in which, by an arrangement of screens, the illuminating system is separated from the observation system. It is thus possible to introduce light from one half of the cornea through the pupil, while observation is made through the other half of the cornea and the corneal reflexes are eliminated. The image obtained allows small details to be seen very clearly.

v. MICHEL (374) has found that when the water is extracted from the albuminous tissues of the eye, refraction is interfered with and the tissues appear cloudy. Cornea and lens contain enough albumen to act like egg albumen. The aqueous and vitreous humors in consequence of their small amount of albumen remain clear.

The opacity caused by freezing is not due to a change in anatomical structure. The coagulation temperature of the frozen and the unfrozen cornea and lens is the same. From this one might conclude that in the opacity due to freezing the composition of the albuminous bodies is not changed.

TURK (375) believes that the retinal venous pulsation arises from a continual extension of the pulse waves from the arteries through the capillaries to the veins. This abnormal extension of the pulsation is caused by the high extravascular pressure to which the vessels of the eye are normally exposed.

BERNHEIMER (376) made a series of experiments on monkeys for the purpose of determining the paths for the synergetic movements of the eyes and the relations of the corpora quadrigemina to these paths.

Experiments were made on narcotized animals (1) without electric or mechanical excitation of the brain, (2) with electric excitation of the cerebral cortex, and (3) observations were made on animals from which the corpora quadrigemina had been extirpated. The results of experiments on nineteen monkeys were as follows :

A monkey whose occipital lobes had been removed performed perfectly synergetic eye movements, both spontaneously and on peripheral, mechanical, or electrical excitation. The same syner-

getic movements were performed when the anterior corpora quadrigemina were removed, and in this case simple light stimulus was sufficient to bring about the movements.

Only when the nuclear regions of the eye nerves were separated by a median section did the synergetic movements cease and the two eyes move irregularly and independently.

The angular gyrus is a pronounced cortical field for synergetic eye movements ; the right gyrus controlling synergetic movements to the left, and the left gyrus movements to the right.

After destruction of the corpora quadrigemina down to the aqueduct of Sylvius, excitation of the angular gyrus still brings about synergetic movements.

After destruction of the anterior corpora quadrigemina, no disturbances of the eye movements are noticed. The only recognizable change is that the pupil on the same side becomes larger and reacts less readily to light.

From all this it is evident that the anterior corpora quadrigemina are not a reflex centre for eye movements, nor do the neurons pass through them to the cortex. Since after median section of the region containing the nuclei of the ocular muscles no eye movements can be brought about by excitation of the right or left angular gyrus, it follows that the neurons connecting the nuclei with the cortex of the angular gyrus must all cross ; the crossing must take place in the median line, but below the level of the aqueduct of Sylvius, since removal of the roof of the corpora quadrigemina does not prevent synergetic movements from being brought about by excitation of the angular gyrus.

Thus the influence of the cerebral cortex on the nuclei of the ocular muscles is of the same type as that on the nuclei of the facial nerves and of the motor nerves of the extremities.

PRENTICE (378) calls attention to the well known fact that in herbivorous animals the lines of sight diverge, while in the carnivorous animals the divergence is less marked. In the savage races a general tendency to divergence is noticeable. With the advance of civilization a tendency to converge becomes manifest, which depends perhaps less on the anatomical conditions of the internal recti than on a tonic innervation of these muscles. This functional convergence ceases with life. In 3000 cases the author assured himself that almost without exception the eyes of the dead diverge.

ABELSDORFF.

PERCIVAL (379) points out that loss of visual efficiency is not

proportional to loss of visual acuity ; thus an individual whose visual acuity is reduced from $\frac{6}{6}$ to $\frac{6}{12}$, has not suffered a loss in efficiency of 50 per cent. He suggests a formula for calculating the loss of efficiency of vision sustained from injury or disease, which might be of use in estimating a fair compensation to be claimed from insurance companies or employers. LISTER.

NORTON (380) has found that the flying white spots, which are undoubtedly corpuscles passing through the lumen of the retinal arteries, are best seen if the source of illumination—a bright even sky, for instance—is viewed through a blue glass ; any colored glass, however, can be used. BURNETT.

STILLSON (381) has devised an apparatus for the more ready observation of the various kinds of ocular spectra, such as the Purkinje figures, the flying white specks, etc. It consists in a three-inch lens mounted in a short tube having a clamp at the other end, into which diaphragms having pinholes of various sizes can be placed ; 18 inches from the distal end is a clamp for holding plates of plain or colored glass and a white cardboard, and beyond, a mirror mounted on a swinging arm that will reflect the light through the glass plate and through the tube holding the lens and pinholes, into the eye of the observer. This serves the same purpose as the point of light from a very strong convex surface used by Zehender, Ayres, the reviewer, and others.

BURNETT.

BARNES (382) says that to create or restore binocular vision he has a fourfold method : 1. Correct all errors of refraction. 2. Orthoptic exercise. 3. Tenotomies and advancement. 4. Refine with orthoptic exercise. He inclines much more to advancements than tenotomies. He gives a table showing the management and results in 24 cases in which binocular vision was restored by these methods. BURNETT.

VI.—REFRACTION AND ACCOMMODATION.

383. KATZ. Headache from low degrees of ametropia. *Wratsch*, No. 28, 1899.

384. PETERS. On myopia from auto-suggestion in school children. *Zeitschr. f. Augenheilk.*, ii., p. 246.

385. CARTER, BRUDENELL. A case of operation for extreme myopia. *Lancet*, p. 87, 1899.

386. WEILAND. What amount of axial myopia theoretically

produces emmetropia for distance after removal of the crystalline? *Annals of Ophth.*, July, 1899.

387. HAIGHT, ALLEN T. Myopia—operative treatment in high degrees thereof. *Four. Amer. Med. Assoc.*, July 15, 1899.

388. CROSS. On the operative treatment of myopia. *Lancet*, July 1, 1899.

388 a. FROST. The optical effect of the removal of the lens in myopia. *Lancet*, July, 1899, p. 155.

PETERS (384) describes cases which he has observed of apparent myopia without spasm of accommodation in school children, that were relieved by wearing very weak — or + glasses, or even plain glasses. These children were all neurotic. He would, however, separate these cases from those of hysterical amblyopia and regard them as cases of myopia by auto-suggestion, since in every case the child simulated perfectly a myopia both in distant and near tests.

CARTER (385) first did extraction of the lens for myopia about 12 years ago, the patient being a boy with 14 D of myopia. The good results have still remained. A young girl with R — 18 — 6 c and L — 12.5 — 6 c was operated on with the result R + 1.5 + .5 c, L + 1.5 + 1.5 c; V = $\frac{2}{30}$. ABELSDORFF.

In this paper WEILAND (386) gives his reasons and demonstrations to show that Jackson is in error in considering that an axile myopia of 17 D will give emmetropia after suppression of the refracting power of the lens, as it is supposed to be in Helmholtz's schematic eye. His calculations make 25 D as the measure of the myopia that under these circumstances give emmetropia. Jackson defends his position in a paper in the same number.

BURNETT.

HAIGHT (386) has operated upon four cases of myopia of high degree. Case I. Girl of 12, R V $\frac{1}{20}$, L $\frac{2}{30}$; L — 16 D, R — 14 D. Discission of left lens, after absorption, L $\frac{2}{30}$ and could read fine print with + 5. Case II. Boy 18 years, M 18 D L, 23 D R. Best vision, R $\frac{2}{30}$, L $\frac{2}{100}$. Left lens, discission and extraction. After three months, V = $\frac{2}{30}$. R eye after same treatment, $\frac{2}{30}$, with — 1.5 c 120°. Case III. Man of 22, M 15 D in each; V $\frac{5}{200}$. Discission and extraction, after which V = $\frac{2}{40}$, but required + 3 and + 4 for reading. Case IV. Girl of 11 years, R 10 D of M, 16 D in L; L lens treated by discission and allowed to absorb. After six months, V = $\frac{2}{30}$. BURNETT.

CROSS (388) considers that the operative treatment of myopia in properly selected cases has gone beyond the experimental stage, and should rank as a thoroughly recognized surgical procedure. The operation he advises in young subjects is discission of the lens, with subsequent linear extraction (= curette evacuation) before or as soon as tension is manifested. In young children simple discission is often sufficient; in older patients he advises a preliminary iridectomy, followed by slight discission of the lens previous to extraction.

He has operated on 48 cases, of which he gives a full table, showing the results. He does not regret having undertaken a single case; not only is the vision improved in almost every case, and in some very greatly, but the general aspect of the patients is changed; they lose their dreamy manner, gain confidence, and take interest in their surroundings.

LISTER.

FROST (388 a) demonstrates clearly how the removal of the lens affects the refraction of the eye. With the lens in situ, every millimetre of difference in the length of the globe corresponds to about 3 D of myopia or hypermetropia. But the aphakic eye being much weaker as an optical instrument, changes in the length produce much less effect, every millimetre of difference corresponding with about 1.38 D.

The emmetropic length of an eye, with the lens in situ is about 23 mm, but the emmetropic length of the aphakic eye is about 31 mm. Therefore abnormalities in length are calculated from different standards in the complete and aphakic eyes.

Example.—With a myopia of 15 D —, the eyeball is 5 mm ($15 \div 3$) longer than the emmetropic eye, and is therefore 28 mm in length. After removal of the lens it is 3 mm shorter than the emmetropic aphakic eye, and requires for its corrections a lens of 4 D — ($1.38 \text{ D} \times 3$).

LISTER.

VII.—MUSCLES AND NERVES.

389. SCHNABEL. Minor contributions to the subject of paralysis of the ocular muscles and of squint. *Wiener klin. Wochenschr.*, Nos. 20, 22, and 31, 1899.

390. SACHS. Can squint cause amblyopia? *Ibid.*, No. 25.

391. ZUCKERKANDL and ERBEN. 1. On the physiology of voluntary movements. 2. On lateral movements of the eye. *Ibid.*, No. 23.

392. STORY. Note on the methods of advancing the recti muscles of the eyeball. *Ophth. Review*, July, 1899.

393. HANSELL and SPILLER. Two cases of unilateral total ophthalmoplegia, crossed hemiplegia being associated with the ocular paralysis in one case. *Annals of Ophth.*, July, 1899.

394. GREENE, D. MILTON. Correction of divergent strabismus by a new method and a new instrument. *Ophth. Record*, Sept., 1899.

SCHNABEL (389) discusses first the diplopia occurring with deviation of the visual line from paralysis of an ocular muscle, and the single vision with deviation of the visual line in squint. He then takes up the function of the muscles moving the eyes laterally and the results of their paralysis, and finally he discusses the theory of squint and squint operations.

According to his idea, the anatomical basis of squint exists when with healthy muscles the distance between the centres of the two corneas in the position of rest is not equal to the distance between the centres of the palpebral fissures, and binocular fixation therefore requires an undue effort on the part of the ocular musculature. If this effort cannot be maintained, monocular fixation results—manifest strabismus. The difference between the two distances between the centres of the corneas and the centres of the palpebral fissures, in rest, is the measure of the deviation of the squinting eye. Since, according to Schnabel, the ocular muscles of those with squint are normal, and the movements of the eyes follow a normal type, the squinting eye accompanies the fixing eye in normal manner, the primary deviation is equal to the secondary, and the degree of deviation remains the same while the accommodative effort is constant. The exclusively uniocular fixation of the squinting person prevents the formation of a common visual field or the development of the function of the macula in the squinting eye to normal vision. The detachment of a muscle alters the position of the centre of the cornea in the position of relative rest by rendering it paretic, and it lessens or corrects the deviation when it causes the centre of the cornea in a position of rest to reach the centre of the palpebral fissure.

SACHS (390) discusses the current ideas in regard to amblyopia ex anopsia and amblyopia strabotica. It seems to him that in fact a particular form of amblyopia is found in squinting eyes whose dependence upon the squint is explained when we consider the manner of seeing of the strabismus patient. The loss of the

ability to direct the entire attention to the impression received by the squinting eye, when both eyes are open, is a characteristic mark of amblyopia strabotica. The final stage of the amblyopia strabotica thus characterized is reached when the squinting eye has lost the ability to fix with the macula. In these rare cases the diminution of vision in the squinting eye must be considered as being dependent upon the squint.

ZUCKERKANDL and ERBEN (391) have made some interesting observations on the lateral movements of the eye, using as material dead bodies and patients with paralysis of the ocular muscles. The muscles which turn the eyes to the right have their sphere of action in the right half of the palpebral fissure only, both in the matter of adduction and of abduction. Similarly the sphere of action of the muscles turning the eyes to the left lies in the left half of the palpebral fissure only. The eye is under the influence of elastic forces which are sufficient to bring it from any position back to the middle of the palpebral fissure.

In one of the cases reported by HANSELL and SPILLER (393) a man received a punctured transverse wound of the lower lid of the right eye from the thrust of an umbrella ferule. No fracture of the bony walls or floor of the orbit could be detected. There was, as a result, a total ophthalmoplegia exterior and interior. From this he in time recovered, but was attacked by a crossed hemiplegia which remained permanent in a degree. The seat of the lesion was, apparently, at the sphenoidal fissure. The other case was seen for only a short while, and the ophthalmoplegia followed a blow on the inner third of the temporal ridge on the left side. There was a marked depression at the seat of injury.

BURNETT.

GREENE'S (394) method of making a "tuck" in the tendon has been used by several before him, but he has devised a pair of forceps which, by passing one blade beneath the tendon, the other being over it, and then screwing them together, makes a fold in the tendon and holds it firmly while he puts in catgut sutures to hold it permanently. The conjunctival flap which is made in exposing the tendon is replaced. There is usually but little reaction.

BURNETT.

Sections VIII.-XII. Reviewed by DR. R. SCHWEIGGER,
Berlin.

VIII. — LIDS.

395. WINSELMANN. On hyperopia as a cause of blepharitis (preliminary communication). *Zehender's klin. Monatsbl.*, xxxviii., p. 240.

396. DENIG. A contribution to the etiology of congenital trichiasis. *Arch. f. Augenheilk.*, xl., 1, p. 121.

397. KUHN. On true congenital distichiasis. *Zeitschr. f. Augenheilk.*, ii., 1, p. 46.

398. MALGAT. Note on entropium and consecutive trichiasis in the lower lids of the aged. *Rec. d'ophth.*, 1899, 8, p. 455.

399. ARD. Blepharitis due to the demodex folliculorum. *Journ. Amer. Med. Assoc.*, 33, No. 4.

400. KARKASCHWILI. On transplantation of the mucosa of the lip in cases of entropium. *Wjest. Ophth.*, 1899, 4-5.

401. MOAURO. Marginal tarso-blepharoplasty. *Report of the XV. Italian Ophth. Congress*, 1899.

402. PES ORLANDO. A clinical contribution to the surgical treatment of true blepharospasm. *Clinica dell' Univers. di Torino*, 1899.

403. DROOGLEEVER FORTUYN. On pathological synchronous movements of the upper lid occurring with movements of the jaw and eyeball. *Inaug. Dissert.*, Freiburg-in-Baden, 1899.

404. WALSH and STEPHENSON. Notes on a case of "lupus lymphaticus" of the eyeball. *Lancet*, p. 1562, 1899.

405. VELHAGEN. A case of angioma lipomatodes of the eye. (Clinical report.) *Zehender's klin. Monatsbl.*, xxxviii., p. 253.

406. PARKER, RUSHTON. Plexiform neuroma of eyelids with ptosis; excision; ptosis relieved by Panas's plastic operation. *Brit. Med. Jour.*, p. 1463, 1899.

407. ZUMSTEEG. Three cases of coloboma of the upper lid. *Dissert.*, Tübingen, F. Pietzker, 1899.

408. KUHN. A short note on the operation for epicanthus. *Zeitschr. f. Augenheilk.*, 1899, ii., 2.

409. GINSBERG. Remarks on Dr. Cohn's paper on herpes zoster ophthalmicus. *Arch. f. Augenheilk.*, xxxix., 4, p. 381.

410. NOYES. Plastic operation for ectropium of the lower lid, with remarks. *N. Y. Eye and Ear Infirmary Reports*, Jan. 1, 1899.

According to WINSELMANN (395), the subjective annoyances of hyperopia cause the patient to rub the eyes frequently with the fingers, thus bringing about a seborrhœa.

KUHNT'S (397) patient, a woman of fifty-two, had along the margin of the lid a row of fine hairs in place of the ducts of the Meibomian glands, which were wanting. Microscopically there was found a double row of Krause's glands in the tarsus and extraordinarily well-developed Moll's glands along the posterior row of cilia. The excision of a portion of the tarsus and the lid 2 mm high, preserving the conjunctiva, was not fully successful. The author believes that it would have been better to have excised both tarsus and conjunctiva for a distance of 3.5 mm from the lid margin and cover the defect with mucosa from the lip.

KARKASCHWILI (400) has transplanted a flap of mucosa from the lip to the intermarginal space in 112 cases of entropium with trichiasis. The transplanted flap became necrotic in one case, in another the flap disappeared in the course of six weeks, in four there was partial necrosis, but in all the others the result was complete. In case of excessive shrinking of the conjunctiva, a portion of the grafted mucosa turned in and took the place of the absent conjunctiva. In five cases the grafts were not sutured but still remained in place. The wound in the lip was never sutured, and always healed in a linear scar. The operation was usually done without narcosis. Recurrences had not been observed. The author prefers this method to all others.

HIRSCHMANN.

DROOGLEEVER FORTUYN'S (403) patient had had a polyneuritis and seven months later a polienccephalitis superior acuta (Wernicke), and the following symptoms on the part of the left eye remained: the palpebral fissure was slightly narrower than the right, raising the lid was done slowly, limited mobility of the ball in all directions, no pupillary reaction, paralysis of accommodation, vision good. When the eye was abducted, the upper lid was raised so that the palpebral fissure was equally wide on both sides. When the eye was adducted, the lid drooped. When the eye was turned downward and inward, the upper lid was elevated.

WALSH and STEPHENSON'S (404) patient, a girl of eighteen, had a congenital anomaly of the right eye. The ball was small, there was a persistent pupillary membrane, and on the lids a *nævus* corresponding to Hutchinson's "*lupus lymphaticus*" of the skin, or lymphangioma. The lids were thickened as in elephantiasis; the plica semilunaris was enlarged and attached to a new growth in the conjunctiva which consisted in a number of transparent yellowish vascular elevations about the cornea.

ABELSDORFF.

PARKER'S (406) patient had a plexiform neuroma of the upper lid which covered the ball and made elevation of the lid impossible. After excision of the tumor, Panas's operation was done for the ptosis, and finally the orbicularis was sutured to the temporal fascia, since the closing of the lid was interfered with.

ABELSDORFF.

ZUMSTEEG (407), discussing sixty-three cases of coloboma of the lid reported in the literature and three cases of his own, divides them all into four categories: (1) simple coloboma, unilateral or bilateral; (2) coloboma with slight changes in the ball near the coloboma; (3) coloboma with dermoid formations, bridges of skin between the forehead and eyeball, and corneal changes; (4) coloboma with other facial defects, particularly the oblique facial cleft. He believes, like van Duyse, that the uniform cause of such malformations is a circumscribed intrauterine adhesion between the amnion and the outer cuticle covering the ocular vesicle of the embryo.

NOYES'S (410) case was that of a girl of fifteen with a cicatricial ectropion of the left lower lid from a burn, the edge of the lid being 15 *mm* below its normal position. A flap, with a pedicle, from the post-auricular region was used and carefully fitted into the space left by the dissection of the lid. The lower, convex edge was stitched first; after the gap caused by the removal of the flap was closed, all fat and superfluous tissue was removed from the under side of the flap. To round off the corner where the flap was turned on itself, the external canthal ligament was divided, and a small bit of skin of the upper lid, where the flap overlapped it, was excised. The thickening and rounding of the flap, which he has observed before in similar cases after healing, he is disposed to treat by cutting along the lower border line of the cicatrix and excising tissue there rather than at the middle of the flap.

BURNETT.

IX.—LACHRYMAL APPARATUS.

411. SOURDILLE. Benign cystic tumors of the lachrymal gland (dacryops). *Arch. d'ophth.*, xix., 8, p. 482.

412. STRSCHEMINSKY. Polypus of the lachrymal sac with histological examination by Gorfein. *Wratsch*, 1899, No. 29.

413. DAXENBERGER. Suppuration of the lachrymal sac and empyema of the ethmoid cells. *Wochenschr. f. Ther. u. Hyg. d. Auges*, 1899, No. 23.

414. FROMAGET. Paroxysmal hysterical lachrymation. *Ann. d'ocul.*, cxxii., 1, p. 61.

415. VALUDE. The bactericidal action of the tears. *Arch. d'ophth.*, 1899, No. 9.

416. SCHEFF. On the relation of nasal to ocular diseases, with special reference to the nasal duct. *Wiener. klin. Wochenschr.*, 1899, 22-28.

417. NOYES. Lachrymal disease. *N. Y. Eye and Ear Infirmary Reports*, January, 1899.

SOURDILLE (411) had the opportunity of examining the tumor and the diseased lachrymal gland in a case of dacryops that he had followed clinically. The cyst at the inner canthus had appeared ten years before. On pressure the tears escaped and the tumor became smaller. Later the tumor remained as large as a hazel-nut. The cyst consisted of a fibrous capsule lined with epithelium which in part was changed and in part appeared to belong to the ducts of the gland. Many ducts opened into the cyst, and their walls were sclerosed and distended. The accompanying chronic inflammation had involved the connective tissue about the acini and formed fibrous bands which had caused the lobules to become atrophic. As the cause of the affection the author regarded an inflammation arising from infection from the conjunctiva, passing along the ducts and reaching the connective tissue. When the ducts became closed at their conjunctival ends the cysts developed.

V. MITTELSTÄDT.

The clinical picture in STRSCHEMINSKY'S (412) case of polypus of the lachrymal sac resembled that of ectasia of the sac. The polypus sprang from the posterior wall of the sac and had a pedicle 3 mm thick. In structure it was a fibroma cavernosum.

HIRSCHMANN.

For certain cases of persistent stricture of the nasal duct, NOYES

(417) uses a style of lead or silver continuously for some weeks. It need not be larger than No. 6 Bowman. The style should be taken out once daily or every other day, and the canal syringed. He relates a case in illustration. BURNETT.

X.—ORBIT AND NEIGHBORING CAVITIES.

418. DAGILAISKI. On orbital phlegmon of dental origin. *Zehender's klin. Monatsbl.*, xxxvii., p. 231.

419. SZNLISLAWSKI. On the development of brain abscesses after orbital phlegmon. *Ibid.*, p. 289.

420. UHTHOFF. A case of syphilitic disease of the orbit. *Allgem. med. Central-Zeitung*, 1899, No. 55.

421. HALLMANN. On the development of orbital tumors after trauma. *Inaug. Dissert.*, Leipsic, 1899.

422. LOBANOFF. Cyndroma of the orbit. *Wjest. Ophth.*, 1899, 4-5.

423. ZIMMERMANN. Demonstration of a boy six years old from whose orbit a retrobulbar cavernoma had been removed nine months before. *Ophth. Klinik*, 1899, No. 13.

424. GOLOWIN. Krönlein's operation for tumors of the optic nerve. *Wjest. Ophth.*, 1899, 4-5.

425. VALUDE. Krönlein's operation. *Gaz. hebdom. de méd. et de chir.*, 1899, No. 62.

426. WEISS. Extirpation of a large retrobulbar tumor by Krönlein's method, with preservation of vision, normal position, and mobility of the eye. *Münch. med. Wochenschr.*, 1899, p. 1265.

427. BÖHM. A case of spontaneous exophthalmus during birth. *Die ophth. Klinik.*, 1899.

428. GILBERT and CASTAIGNE. Exophthalmic goitre. *Le progrès méd.*, 1899, No. 23.

429. PITRES. The treatment of exophthalmic goitre by injections of iodoformed ether into the parenchyma of the thyroid body. *La semaine méd.*, 1899, No. 33.

430. WHITE, HEATON. Organo-therapy in exophthalmic goitre. *Brit. Med. Journ.*, p. 787, 1899.

431. PETERS. Remarks on the result of nasal treatment in diseases of the eye. *Zeitschr. f. Augenheilk.*, 1899, ii., 2.

432. HUNTER. A case of gumma at the apex of the orbit. *N. Y. Eye and Ear Inf. Reports*, January, 1899.

433. NOYES. Cases of ethmoiditis. *Ibid.*

434. BURNETT. A case of traumatic enophthalmus. *Amer. Journ. of Ophth.*, July, 1899.

435. BRUNS and ALT. A case of spindle-cell sarcoma of the orbit. *Ibid.*, Sept., 1899.

436. BRUNER. Septic thrombosis of the cavernous sinuses. *Ophth. Record*, July, 1899.

According to DAGILAIKI (418) alveolar suppuration may be transmitted to the eye either through the periosteum of the anterior wall of the upper jaw, with its network of veins which anastomose with the superior and inferior ophthalmic veins; or through the antrum by the pus breaking through its upper wall. He mentions in conclusion those diseases of the eye which have been supposed to stand in some reflex connection with the teeth viz., phlyctenular conjunctivitis, paresis of the ciliary and other ocular muscles, glaucoma, amblyopia, cataract, etc.

SZNLISLAWSKI (419) found that orbital phlegmon might lead by metastasis both to meningitis and to brain abscess. In cases in which there are no focal symptoms the abscess may be presumed to be in the frontal lobe corresponding to the phlegmon.

In UHTHOFF'S (420) patient the right eye had gradually become prominent in the course of two months and all the orbital nerves had become involved. A scar suggesting syphilis was found in the rhino-pharynx and under anti-syphilitic treatment the orbital tumor disappeared in a few days.

The tumor described by LOBANOFF (422) was situated on the anterior portion of the inferior wall of the orbit and proved to be a cylindroma with amyloid degeneration. HIRSCHMANN.

In ZIMMERMANN'S (423) case a congenital cavernoma of the orbit, diagnosed *per analogiam* from the presence of a vascular tumor of the forehead, caused an exophthalmus of 11 mm in its six years of growth. Compression of the common carotid caused the ball to recede 4 mm temporarily. After operative removal of the tumor from before, the exophthalmus gradually disappeared.

GOLOWIN'S (424) case was that of a boy with exophthalmus. A myxomatous fibro-sarcoma of the optic nerve was removed by Krönlein's method with preservation of the ball, which was, however, sightless. HIRSCHMANN.

WEISS (426) removed by Krönlein's method a retrobulbar tumor which proved to be a cavernous angioma. The eyeball, which still had vision, was preserved. This operation, which should always be used in cases of tumor deep in the orbit, is also indicated when the orbit is to be entered for diagnostic purposes.

Occasionally after the operation the eye remains in a position of convergence, perhaps with limitation of its mobility outward in consequence of cicatrization in the depth of the orbital cavity. The hemorrhage is usually slight, but at times it is so great that the lids must be sutured over the ball and the cornea sometimes becomes ulcerated.

In BÖHM'S (427) patient, a woman who had previously suffered from acute nephritis, during normal labor pains one eyeball became prominent several times and six hours later again became prominent, with paralysis of all the muscles, complete blindness, and signs of cerebral irritation. The fundus was normal. The ball regained its mobility and normal position sixteen days later, but the optic nerve became atrophic. Nine months later the patient complained of a feeling of swelling in the upper lid, which she had experienced in former pregnancies, but the lid appeared normal. Although there was no suffusion of the conjunctiva, Böhm believed that there had been hemorrhage into the orbit.

Of WHITE'S (430) three cases of Basedow's disease, two without excessive exophthalmus were treated with extract of the thymus gland with relatively good results. The third case, with marked exophthalmus, was treated with extract of suprarenal capsule without perceptible improvement in the exophthalmus although there was subjective benefit.

ABELSDORFF.

PETERS (431) describes cases in which the lachrymal sac seems to be dilated, but from which pressure or the delicate passage of sounds brings no pus, but this appears after the more forcible use of probes. These cases represent abscesses lying behind the sac which have broken through from empyemas of the frontal, ethmoidal, or maxillary sinuses.

In general, Peters recommends treating the nasal mucous membrane in all cases of disease of the sac. The affections of the sac found in the new-born are frequently due to an atresia of the opening of the duct in the nose, due to pressure on the duct. Secretion from the sac which cannot pass down into the nose on account of the atresia, but remains at the inner canthus, may simulate the secretions of a severe conjunctivitis or even a blennorrhœa.

In concluding, Peters describes two cases of vesicular eruption along the margin of the cornea, with a good deal of irritation and frequent recurrence, which were permanently cured only after the swollen nasal mucosa had been treated.

The patient whose history HUNTER (432) gives was a woman with an antecedent history of syphilis and iritic adhesions in both eyes. The right eye failed suddenly and its mobility was almost abolished. No ptosis. O. S. nil. Later ptosis developed and anæsthesia of the cornea, and during the long course of the disease the epithelium became disturbed. The nerve head became gradually atrophic and vision reduced to p. l. but the mobility returned. The medication was heavy doses of the iodide, 540 grains a day being administered for many months consecutively. In ten months it is estimated she took twenty pounds. No harm seems to have come from its use.

BURNETT.

NOYES (433) relates the histories of three cases of ethmoiditis, all of which were treated at first as abscess of the lachrymal sac. In all, drainage through the nose was established after a thorough curetting of the cells. Cure resulted in all cases.

BURNETT.

The case described and pictured by BURNETT (434) was a negro who was thrown violently on the head, making a fracture of the frontal bone on the right side and great pressure on the left eye. When seen by Burnett some weeks after, there was a sinking of the left eye in the orbit, it being quite a centimetre behind the other eye; paresis of all the muscles of the eye, motion downward being entirely lost; orbicularis intact, but levator restricted. Fundus was normal, except for evidences of hemorrhages in the retina. Cornea healthy; pupil clear. L. V fingers at $2\frac{1}{2}$ metres; R. nil on account of hemorrhages in the vitreous.

BURNETT.

The case of BRUNS (435) was a healthy-looking white boy of four years who had a swelling—like an abscess—of the edge of the right upper lid, with chemosis of the conjunctiva. As an exploratory incision showed a suspicious-looking mass instead of pus, the lid and content of the orbit were removed. The growth recurred in the orbit and eight and one half months after the operation the child died. Alt, who examined the specimen, found it to be a spindle-cell sarcoma of the orbit which had evidently sprung from the posterior portion and supplanted all the tissues.

there except the muscles. The optic nerve was atrophic and œdematous.

BURNETT.

BRUNER (436) gives the clinical history in great detail of a case of septic thrombosis of the cavernous sinuses beginning in the right and in a few days extending to the left eye, brought about by a disease of the alveolar process on the right side. It does not appear that the antrum was at any time affected. There was great swelling of the lids and orbital tissues, causing exophthalmus with all the symptoms of pressure on the nerves. There was total blindness, as the result of this compression, before death. The general septic symptoms were very severe. He died on the fifteenth day. No post-mortem could be obtained.

BURNETT.

XI.—CONJUNCTIVA.

437. MAZZA. Argyrosis of the conjunctiva following the use of nitrate of silver used as a dye for the hair and beard. *XV. Italian Ophthal. Congress*, Turin, 1899.

438. BATTEN. Chronic œdema of the conjunctiva associated with disease of the middle ear. *Lancet*, p. 958, 1899.

439. KAMEN. On the etiology of epidemic inflammations of the conjunctiva. *Centralbl. f. Bacteriol.*, xxv., 12-13.

440. KAST. An epidemic of acute contagious conjunctivitis. *Ibid.*, 13.

441. FRAENKEL. On the presence of the meningococcus intracellularis in purulent inflammations of the conjunctiva. *Zeitschr. f. Hygiene u. Infectious-Krankheiten*, xxxi., 1899.

442. HOFFMANN. On conjunctivitis due to the diplobacillus. *Graefe's Archiv*, xliii., 3, p. 638.

443. SCHAEFFER. A case of diphtheritic conjunctivitis, interesting in its development, accompanying symptoms, and therapy. *Zehender's klin. Monatsbl.*, xxxvii., p. 258.

444. BIETTI. Typical blennorrhœa neonatorum due to the bacterium coli commune. *Zehender's klin. Monatsbl.*, xxxvii., p. 311.

445. HIRSCHBERG, I. Remarks on operation for and the anatomy of trachoma. *Berl. klin. Wochenschr.*, 1899, No. 39, p. 849.

446. SACHS. A case of pemphigus of the conjunctiva. *Wiener klin. Wochenschr.*, 1899, No. 24, p. 671.

447. KRAUSE. On infantile xerosis of the conjunctiva with keratomalacia. *Inaug. Dissert.*, Jena, 1899.

448. SCHAPRINGER. Congenital duplicatures of the palpebral conjunctiva—a hitherto undescribed typical malformation of the human eye. *Zeitschr. f. Augenheilk.*, 1899, ii., 1, p. 41.

449. FALCHI. A congenital anomaly of the sclero-conjunctiva and the cornea. *Arch. f. Augenheilk.*, xl., 1, p. 68.

450. KROLL. On cysts of the bulbar and palpebral conjunctiva. *Inaug. Dissert.*, Greifswald, 1899.

451. DE BERARDINIS. On a peculiar form of symblepharon. *Ann. di Ottalm.*, xxviii., 1.

452. LOBANOFF. A subconjunctival dermoid. *Wjest. Ophth.*, 1899, Nos. 4-5.

453. LOBANOFF. Lymphoma of the conjunctiva. *Ibid.*

454. VOLLARO. Lympho-sarcoma of the plica semilunaris. *Ann. di Ottalm.*, xxviii., 1.

455. EAGLETON. Report of a case of accidental inoculation of the eyeball with vaccine virus. *Ophth. Record*, July, 1899.

MAZZA (437) found marked argyrosis of both conjunctivæ without the involvement of any other parts, after the use of nitrate of silver as a hair dye. Nitrate of silver had never been used in any other way.

KRAHNSTÖVER.

BATTEN (438) treated a man of thirty-three for an œdema of the eye for a period of some months without result. After removal of a large polypus which had perforated the left membrana tympani, and local treatment of the ear, the œdema of the conjunctiva disappeared. Batten believed that there was an obscure yet causative relation between the affection of the middle ear and that of the orbit and eye.

ABELSDORFF.

KAMEN (439) found that an epidemic of acute conjunctivitis was due to the Weeks bacillus. The microscopic appearances were identical with those described by others, but the cultures did not correspond so closely to previous descriptions. Pure cultures of this bacillus, like those of the influenza bacillus, were best obtained by using Pfeiffer's blood-agar as a medium. The morphological and biological peculiarities of the Weeks bacillus make it seem probable that it belongs to the group of influenza bacilli. These bacilli are not resistant and are difficult to grow in cultures. For animals they seem to be pathogenic in but small degree.

In conjunction with the previous paper is one by KAST (440) in which the clinical symptoms observed in this epidemic are described.

FRAENKEL (441) found the meningococcus intracellularis (Weichselbaum) to be the cause of pseudo-membranous conjunctivitis in three cases. This coccus, which often resembles the gonococcus, gives up the stain, when Gram's method is used, very slowly and irregularly. Fraenkel believes that cultures are necessary to distinguish it absolutely from the gonococcus.

HOFFMANN (442) in Greifswald found diplobacilli in about half of one hundred cases of conjunctivitis in which he examined the secretion. In one case there was quite acute muco-purulent conjunctivitis, and in two there were complicating corneal ulcers. Weak solutions of sulphate of zinc always caused a rapid recovery.

In SHAEFFER'S (443) case, a week after a fall on the face diphtheria of the conjunctiva and the rhino-pharynx appeared, but yielded in three days to injections of Behring's serum No. III.

In a case of blennorrhœa of the new-born that appeared to be gonorrhœal, BIETTI (444) found only the bacterium coli, whose reactions he describes in detail.

HIRSCHBERG (445) does not favor excision of the retrotarsal folds in trachoma because the danger of relapse remains and the danger to the cornea is increased. He has never seen unfavorable results follow expression with the roller forceps. He performs excision of the retrotarsal fold in cases of circumscribed hard granulations that have resisted other forms of treatment; the case he cites, however, is certainly not one of trachoma.

SACHS'S (446) patient, a man of twenty-five, had suffered for five years from pemphigus which, in the last four years, had affected the conjunctiva and cornea. The vesicles led to ulceration, and now the cornea and conjunctiva are cicatricial. Vision is reduced to the ability to count fingers.

KRAUSE (447) made a microscopic examination of the eyes of a child of five, in whom a xerosis of the conjunctiva with an ulcer of the cornea was in process of healing. In the conjunctival epithelium, as well as in the ulcer, he found microorganisms which he regarded as having caused the disease by ectogenous infection.

SCHAPRINGER (448) found several duplicatures of conjunctiva extending from the retrotarsal fold to the tarsus in a case in

which externally the appearance of the eye was normal. He regarded these as congenital amniotic adhesions.

FALCHI (449) describes a teratoid tumor of the sclero-corneal junction which was composed of elements of the retrotarsal folds, goblet cells, glands, vessels, nerve endings, etc.

KROLL (450) divides the cysts of the conjunctiva as follows :
1. Congenital, (*a*) with microphthalmus, (*b*) dermoid, (*c*) cysts arising from the nasal mucosa, (*d*) meningoceles. 2. Of spontaneous origin, (*a*) lymph cysts, (*b*) simple serous cysts of the bulbar conjunctiva, (*c*) cysts arising from Krause's glands, (*d*) in pterygia. 3. Of traumatic origin, (*a*) simple, (*b*) from hematoma, (*c*) after perforating wounds of the ball. He classifies in this order the reports in the literature, and adds three new cases with microscopic examination.

A peculiar form of symblepharon was seen by DE BERARDINIS (451) in a child of five, which had followed a severe conjunctival inflammation at the age of six months. A grayish-red membrane passed from the convex margin of the upper tarsus to the corresponding margin of the lower, its outer free border being hidden beneath the outer commissure, its inner leaving a considerable portion of the cornea free. Beneath this membrane the eye was freely movable, and the conjunctival sac, both above and below, was of normal depth. The length of the membrane is sufficient to allow a moderate opening of the lids. After its removal the eyeball and conjunctiva appeared to be in every respect normal. It was found that at the beginning of the inflammation the hyperæmic conjunctiva had been rubbed with the rough leaf of a certain plant, after which the eye was left to itself. An adhesion then took place between the swollen lids, and as the inflammation passed off the adhesion was drawn out into the membrane described.

KRAHNSTÖVER.

LOBANOFF'S (452) dermoid was situated beneath the conjunctiva, temporally and above, and was symmetrical in the two eyes.

HIRSCHMANN.

LOBANOFF (453) found two tumors on one eye, one on the bulbar conjunctiva near the outer commissure, the other in the upper retrotarsal fold. Both proved to be small-celled lymphomata with scanty interstitial substance.

HIRSCHMANN.

In the case reported by EAGLETON (455), a physician, while vaccinating a child, accidentally broke the glass tube and a part of its contents flew into his eye. On the third day he had some

fever and much discomfort in that eye. An examination showed a bleb on the conjunctiva of the ball about 2 mm from the limbus on the outer side. It was filled with a yellowish fluid. It was evacuated and an antiseptic wash used. The temperature went down in a day or two and no further trouble was experienced. The physician had been successfully vaccinated in youth, and unsuccessfully several times since. BURNETT.

XII.—CORNEA, SCLERA, AND ANTERIOR CHAMBER.

456. HAUKE. Opacity of the cornea from nitro-naphthalin. *Wiener klin. Wochenschr.*, 1899, No. 27.

457. HAAB. On grill-like (gittrige) keratitis. *Zeitschr. f. Augenheilk.*, 1899, ii., 3.

458. MANZ. Parenchymatous keratitis with demonstration of fluorescein staining. *Münch. med. Wochenschr.*, No. 32, 1899.

459. BIHLER. On the diagnosis of endothelial affections of the cornea by means of fluorescein, particularly in beginning sympathetic ophthalmia. *Ibid.*

460. BAAS. On dendritic keratitis and its relation to herpes of the cornea. *Inaug. Dissert.*, Giessen, 1899.

461. KOSTER. A case of zona ophthalmique with interstitial keratitis but without epithelial lesions. *Ann. d'ocul.*, 1899, Feb.

462. FLEMMING, PERCY. A case of ophthalmic herpes with hypopyon keratitis. *Lancet*, 1899, p. 587.

463. FROMAGET. Severe and early ocular syphilis; paralysis of the third pair and interstitial keratitis. *Ann. de Policlinique de Bordeaux*, 1899, No. 4, p. 57.

464. BAQUIS. On the nature and genesis of the various hyaline formations of the cornea. *Report of the Fifteenth Italian Ophth. Congress*, Turin, 1899.

465. DE WECKER. Aseptic tattooing of the cornea. *Arch. f. Augenheilk.*, xxxix., 4, p. 375.

466. KRUCKENBERG. Bilateral congenital melanosis of the cornea. *Zehender's klin. Monatsbl.*, xxxvii., p. 254.

467. JARNATOWSKI. Delay in cicatrization of the corneal wounds after cataract extraction. *Arch. d'opht.*, xix., 7, p. 429.

468. FRIEDLAND. The pathological anatomy of scleritis. *Graefe's Archiv*, xliii., 2, p. 283.

HAUKE (456) found in a worker in naphthalin the same corneal changes that Frank described (*Beiträge f. Augenheilk.*, 31). Without signs of inflammation a delicate horizontally oval opacity formed in the middle of the cornea, dependent upon a superficial alteration in the epithelium. Within a period of two years the cornea became normal again.

HAAB'S (457) grill-like keratitis is a rare affection which begins as a faint central opacity without much disturbance of vision or circumcorneal injection. By transmitted light the opacity is seen to consist of forked lines and of points scattered among them, giving first the effect of grill-work and later of a densely opaque spot.

The surface of the cornea is roughened, but no vessels are present. The process is apparently a degenerative one—a deposition of hyalin in the deeper layers of the corneal epithelium and later in Bowman's membrane and the underlying substantia propria, for after scraping off the epithelium the grill-like figures remain. This keratitis is a family affection.

BIHLER (459) reports an investigation undertaken to determine the degree to which fluorescein may stain the deeper portions of the conjunctiva while the epithelium is intact. In a case of iritis, three days before the outbreak of marked symptoms a small area of endothelium could be stained and this daily grew larger. In parenchymatous keratitis Bihler's results did not accord with those of v. Hippel. Precipitations on the posterior surface of the cornea did not take the stain. In cases of sympathetic irritation, as well as in iritis, fluorescein aids in making an early diagnosis. His patient had suffered an injury to the left eye, and twelve days later there was complaint of irritation of the right eye, although all objective signs of sympathetic inflammation were wanting and vision was but slightly affected. Nevertheless a central area of endothelium as large as the lens took the green stain.

Following a herpes of the face there developed in FLEMMING'S (462) patient a herpes of the cornea with a spreading ulcer and a collection of pus in the anterior chamber. A wrong diagnosis having been made, the ulcer was cauterized with carbolic acid and the conjunctiva treated with nitrate of silver, and the ulcer progressed. When the neuropathic nature of the affection was recognized, the lids were sutured together and hot fomentations were used. With this treatment the ulcer soon healed.

ABELSDORFF.

FROMAGET'S (463) patient, a year after infection with syphilis, suddenly had a total left oculomotor paralysis, due, in the author's opinion, to a hemorrhage compressing the nerve trunk. After a month the paralysis gradually diminished, leaving only slight functional defects. An iritis then developed accompanied by a vascular infiltration of the cornea—a partial interstitial keratitis which passed off in a month and a half under treatment with mercury and iodide of potassium. This prompt reaction to treatment, the unilateral nature of the affection, and the relative absence of irritation led the author to characterize it as a case of interstitial keratitis due to acquired syphilis.

BAQUIS (464) holds the opinion that the yellow globular masses found in old leucomas are of epithelial origin, although he would not rule out absolutely other sources of origin. Whether they are of hyaline or colloid nature is still undetermined. KRAHNSTÖVER.

DE WECKER (465), commenting on v. Sicherer's paper (*Archiv f. Augenheilk.*), states that with his best India ink rubbed up in 1:2000 bichloride he has never seen signs of irritation following tattooing. When the tattooing is done for optical purposes, for which it is done too rarely, instead of fixing the eye with a speculum and forceps this should be done with the fingers.

KRUCKENBERG (466), in a woman of forty-five, with an otherwise normal anterior segment of the eyeball, found in the deeper layers of each cornea before the pupil an oval spot of the same brown color as the iris, composed of a finely granular mass and appearing in transmitted light as a very faint opacity causing no distortion of images. The author believed it to be congenital.

After reporting a case in which the anterior chamber remained open for several days after an extraction and only closed when the dressings had been left off for two days, JARNATOWSKI (467) discusses the causes of this late closure. Apart from incarceration of capsule, conjunctiva, or blood clots, the principal cause is an irregularity of the section. An improper bandage or entropium of the lower lid may favor the remaining open of the lid, as may also atropine and cocaine by disturbing the nutrition of the tissues, while diabetes and albuminuria are by some wrongly reckoned as causes. If the wound remains open long the epithelium extends over the edges and hinders closure. The treatment consists in rest and proper bandaging. Iridectomy may be done. In one case the passage of a spatula between the lips of the wound was sufficient.

V. MITTELSTÄDT.

FRIEDLAND (468) presents the clinical histories and microscopic examinations of two eyes with non-suppurative scleritis of the anterior segment with foci of necrosis. In both cases there was an accompanying choroiditis.

Sections XIII.-XVIII. Reviewed by DR. O. BRECHT,
Berlin.

XIII.—LENS.

469. ZELLER. On cataract and diabetes. *Inaug. Dissert.*, Tübingen, 1899.

470. LEVINSOHN. A contribution to the operation for secondary cataract. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 207.

471. PERETTI. A case of bilateral symmetrical luxation of the lens after injury of the skull. *Zeitschr. f. Augenheilk.*, ii., p. 225.

472. KAEMPFFER. Congenital coloboma of the lens. *Graefe's Archiv*, xlviii., p. 558.

473. CHANDLER. Capsular cataracts. *Ophth. Record*, Sept., 1899.

ZELLER (469) reports on 56 cases of cataract with diabetes. One patient was under twenty years of age, 4 between twenty and thirty, 6 between thirty and forty, 7 between forty and fifty, 17 between fifty and sixty, 19 between sixty and seventy, and 2 over seventy. There were 25 men and 31 women. The amount of sugar varied between a faint trace and 6 per cent. The author classes as diabetic cataract only such as develop like the soft cortical cataract of young persons. In these cases the cataract forms quickly, usually in both eyes at the same time, the lens swells, the anterior chamber is shallow, the patient is usually young, and there are present other diabetic manifestations in the eye. These conditions were found in 32 per cent. of Zeller's patients. In 25 per cent. there was albuminuria also, and in 10 per cent. there was retinitis. In 42 cases extraction was done, which in 2 cases was followed by severe iritis. The results of the operations were not particularly good.

LEVINSOHN (470) has modified de Wecker's scissors so that they can be used both to perforate the cornea and to divide the secondary cataract. Practical use of the instrument has not yet been made.

KAEMPFFER (472) in a comprehensive paper gives a *résumé* of our knowledge of coloboma of the lens, describes a number of cases, and takes up the various theories as to the genesis of coloboma, concluding that no single explanation is sufficient.

CHANDLER (473) has found from his experience that the essentials of a proper operation on the capsule are good illumination and a sharp knife. To supply the former he has devised an electric-light apparatus whose focal distance can be regulated, and to this can be attached a pair of fixation forceps or a knife-needle—all being directly under the operator's control. The knife should be entered at the sclero-corneal junction and farthest away from the intended puncture through the capsule. A straight incision of proper length he has always found sufficient. He uses a sickle-shaped blade of medium size. BURNETT.

XIV.—IRIS.

474. GOLDZIEHER. Iritis glaucomatosa. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 257.

475. HEATH. The treatment of prolapse of the iris. *Ophth. Record*, Sept., 1899.

GOLDZIEHER (474) observed five patients who had suffered from iritis without any synechiæ remaining. After a year or two the iritis recurred with excessive fibrinous exudation. Atropine being used, there developed suddenly increased tension, cloudiness of the cornea, diminution of vision to perception of light, chemosis, and swelling of the lids. The glaucomatous attacks were cured by the use of pilocarpine or eserine. The author believes that the precipitated fibrinous masses choked the anterior channels of exit of the aqueous humor and thus set up a glaucoma from retention.

HEATH (475) contends for a very conservative treatment of prolapse of the iris, giving several cases in support of this policy, in which he will find himself supported by an increasing number of surgeons. Tinkering with a prolapsed iris even after cataract extraction is always a risky procedure. BURNETT.

XV.—CHOROID.

476. SILEX. The early diagnosis of sarcoma of the choroid. *Berlin. klin. Wochenschr.*, 1899, No. 32.

477. TERRIEN. Sarcoma of the choroid, complicated with phthisis of the eyeball. *Arch. d'opht.*, xix., No. 8, p. 471.

478. MARSHALL, DEVEREUX. Sarcoma of the uveal tract. *Ophth. Hosp. Reports*, xv., 1, May, 1899.

479. ALT. A case of early diagnosis of a choroidal sarcoma. Removal of the eyeball and examination. *Amer. Jour. of Ophth.*, Sept., 1899.

In a physician of fifty, who complained of scintillation only, SILEX (476) found a detachment of the retina, 2×3 p. d. in area and 1.33 mm high. There was myopia of 3.5 D, $V = \frac{2}{3}$, and no other pathological condition. A diagnosis of sarcoma was made. After enucleation there was found a firm, slightly pigmented sarcoma, with some round cells, and in some parts an alveolar structure. It was 6 mm long, 3 mm broad, and 1.5 mm high. It could not be determined from what layer of the choroid the tumor arose.

TERRIEN (477) describes the occurrence of phthisis bulbi with sarcoma, preceding or following the development of the latter, and reports cases. He agrees with other authors that the atrophy of a ball containing a sarcoma is caused by an infectious irido-choroiditis, which may check the further growth of the tumor. He does not consider the atrophy a favorable complication, since metastases may still take place and sympathetic ophthalmia is not rare.

V. MITTELSTÄDT.

The paper by MARSHALL (478) consists of a report on a series of cases of sarcoma of the uveal tract.

The first part of the paper is a supplement to a tabulated record of 103 cases, published in the *Royal London Ophthalmic Hospital Reports*, vol. xiii., part 2, Dec., 1891, by Messrs. Lawford & Collins, and gives further information concerning these cases, which has been obtained since that date.

The second part is a similar report on fifty-eight cases which have been collected since 1891.

Two important points are brought out with regard to (1) the age of patients and (2) the tension of the eye.

(1) The greatest number of cases occurred between the ages of fifty and seventy; the youngest was a man of twenty-eight and the oldest a woman of seventy-four.

(2) In tumors of the choroid the tension was raised in 66.66%; normal in 30.3%; diminished in 3.03.

In tumors of the ciliary body the tension was raised in 25%; was normal in 50%; was diminished in 25%.

LISTER.

ALT's (479) patient was a man of thirty-one years, who com-

plained of a "sparkling" and shadow before the left eye. $V = \frac{2}{3}0$, with $+ 1.5$. A scotoma, oval in form, to the temporal side, beginning 10° from the papilla and extending to the periphery; its vertical diameter was about 30° . Corresponding to this there was a raised portion of the retina, yellowish white, with red patches, the vessels passing over it slightly tortuous. In a month the subjective symptoms had somewhat increased, and the eye was enucleated. On examination, a flat tumor, 10 mm long by 7 wide and 3 in height, was found, with the retina firmly adherent to its apex; no exudation between tumor and retina. The tumor was densely packed with spindle cells, forming large bands, which crossed each other in all directions, with here and there aggregations. These cells contained at places pigment granules of various shades of brown. No return nineteen months after operation.

BURNETT.

XVI.—VITREOUS.

480. HESS. Fat in place of vitreous. *Seventy-first Meeting German Naturalists and Physicians*, Munich, Sept., 1899.

XVII.—GLAUCOMA.

481. SCHÜSSELE. On the relations of primary glaucoma to sex, age, and refraction, as shown in the patients of the Tübingen clinic. *Inaug. Dissert.*, Tübingen, 1899.

482. BAJARDI. The general intra-arterial pressure in its relation to some ocular affections. *Report of the XV. Italian Ophth. Congress*, Turin, 1899.

483. HOLMSTRÖM. A case of migraine complicated with glaucoma, with some remarks on glaucoma. *Nord. med. Ark.*, 1899, No. 21.

484. BALL, RENAUD, and BARTLETT. Excision of the right superior cervical ganglion of the sympathetic for glaucoma. *N. Y. Med. Four.*, July 1, 1899.

485. ALT. A case of glaucoma chronicum simplex in a girl of thirteen years of age, evidently induced by the instillation of atropin. *Amer. Four. of Ophth.*, Sept., 1899.

486. BIZE. Glaucoma following supraorbital neuralgia of malarial origin. *N. Y. Med. Four.*, Sept. 16, 1899.

SCHÜSSELE (481) has tabulated the 494 cases of primary glaucoma seen in the Tübingen clinic. They represent 0.73 % of the

total number of patients. Twice as many women were affected as men, 12% were under forty years of age, and 88% over forty. The inflammatory form was seen twice as often as the simple. 41.2% were hyperopic, 43.4% emmetropic, and 15.5% myopic, an increased disposition among the hyperopic not being manifest. The second eye was, as a rule, affected soon after the first, and usually at least within three years.

BAJARDI (482) found by a great number of measurements of the intra-arterial pressure in the radial artery that often a considerably increased intraocular tension may be present with normal arterial tension, and that quite as frequently the general arterial tension is increased in cases of subacute glaucoma. In inflammatory glaucoma the arterial tension was almost always high.

KRAHNSTÖVER.

HOLMSTRÖM'S (483) patient was a woman of forty-seven who had suffered with regularly recurring attacks of glaucoma from her thirty-second year. She had observed recently that vision grew worse at each attack, and colored rings were seen. When the attack passed off vision became normal again. There were no objective signs of glaucoma. Some months later the patient appeared with the complaint that the vision of the right eye had become greatly diminished in the last attacks, and that it had not improved again. The right eye then showed pronounced glaucomatous changes. After an iridectomy, the glaucomatous signs disappeared, and in the following attacks vision did not become affected. The left eye remained unchanged at first—*i. e.*, with each attack of migraine disturbances of vision occurred but passed off again. A year and a half later glaucoma appeared in this eye also, and was relieved by two iridectomies. DALÉN.

In the case reported by BALL, RENAUD, and BARTLETT (484), a man of fifty-six, who was likewise deaf and dumb, had a chronic glaucoma in the right eye of the typical sort with $T + 3$. Complained of pain in and around the eye. The right superior cervical sympathetic ganglion was removed by cutting down along the sterno-mastoideus, exposing the jugular vein, and tying it. The trapezius was then separated from the sterno-mastoideus and the spinal accessory cut. A deep dissection exposed the carotid sheath. This was opened and the pneumogastric exposed. This was pulled forward so as to bring into view the rectus capitis anticus major muscle on which the ganglion

rests. It was stripped and cut, dividing all the fibres. Tension was reduced to $\frac{1}{2}$. BURNETT.

ALT (485) saw the girl, whose history he gives, when she was eighteen, at which time she was suffering from a complete chronic simple glaucoma in the right eye ($V = 0$) and one of less degree in the left ($V = \frac{2}{30}$) and a much restricted oval-shaped field). The trouble dated, according to the history, from the application of atropine for testing refraction, five years before. BURNETT.

BIZE (486) relates a case of periodically recurring attacks of glaucoma which were finally dissipated by large doses of quinine.

BURNETT.

XVIII.—SYMPATHETIC OPHTHALMIA.

487. GRUENING. A case of corneal wound with prolapse of the iris followed by sympathetic ophthalmia. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1899.

488. MARPLE. Microscopic examination of a globe with a corneal wound and prolapse of the iris which caused sympathetic ophthalmia in the other eye. *Ibid.*

The patient, whose history GRUENING (487) records, was a girl of five years who had a horizontal corneal wound made by a piece of glass. The iris was prolapsed into the wound when seen two days after. An offer to excise the iris was refused by the parent. Twenty-three days after, the child was presented with a full-blown sympathetic cyclo-iritis in the fellow eye with a profound inflammation in the eye injured. Enucleation was not allowed, but an effort was made to free the iris from the wound. Finally enucleation was agreed to. Vision in the sympathetic eye was, some weeks after, $\frac{1}{10}$. BURNETT.

This is a report by MARPLE (488) of an examination of the eye removed in the case reported by Gruening in the same number. He found the original wound confined entirely to the cornea, its end on the nasal side being 1.5 mm from the scleral border. The iris and ciliary body were densely infiltrated with round cells, as was the optic nerve whose sheath was distended. BURNETT.

Sections XIX.—XXII. Reviewed by PROF. GREEFF, Berlin.

XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

489. SCIMENI. On a peculiar pigmentation of the fundus. *Report of the XV. Italian Ophth. Congress*, Turin, 1899.

490. GAUDENZI. Three cases of grave amblyopia following the suturing together of the lid in infancy. *Trans. XV. Italian Ophthal. Congress*, Turin, 1899.

491. PICK. A contribution to the subject of tortuosity of the vessels. *Arch. f. Augenheilk.*, xxxix., p. 382.

492. GIFFORD. Blindness from drinking methyl alcohol. *Ophth. Record*, Sept., 1899.

493. MOULTON. A case of amblyopia due to the use of methyl alcohol. *Ibid.*, July, 1899.

494. REIK. Typical diabetic retinitis. Report of two cases. *Annals of Ophth.*, July, 1899.

SCIMENI (489) believes that many forms of chorio-retinitis occurring in patients with syphilis are confounded with retinitis pigmentosa. He would consider them to be due to syphilis purely.

KRAHNSTÖVER.

GAUDENZI'S (490) three observations of grave amblyopia after the lids had been closed for years by operation in cases in which the eye externally and internally appeared healthy, led him to believe in an amblyopia ex anopsia.

KRAHNSTÖVER.

GIFFORD (492) reports two cases of blindness after the ingestion of wood alcohol. In Case I. a man of forty-five years drank a half-pint of a mixture containing two-thirds water and one-third wood alcohol. The next day his head felt sore and confused, and he took another drink of the same. On the second day he vomited the whole night; the next morning objects looked foggy. Vision diminished, and on the second day after—the fourth after the first ingestion—he was totally blind. When seen twenty days after the drinking, the disks were decidedly atrophic, eyes otherwise normal. In ten days V began to return slightly so as to enable him to count fingers at a few feet. Outer fields normal for white, but a central scotoma. This remained for about a week, after which V began to go, and in a few weeks was reduced to perception of movement in one eye and fingers at four feet in the other. The vessels of the retina became gradually narrower. Case II. Two men drank of a mixture of water and wood alcohol, one freely. The latter became wildly excited, with rapid respiration but no fever, and was found blind at the end of twenty-four hours, and two hours after this died. BURNETT.

MOULTON (493) reports that a man, together with some thirty or forty others, drank wood alcohol; five of them, including the

patient, taking about one half-pint each. All were ill, and two died in the course of twenty-four hours. Two recovered perfectly. The patient became weak but not unconscious. The day following the drinking, the sight became affected, and in a few hours was lost entirely. In a few days some sight returned, and this he still has. R, p. 1.; L, fingers at one foot; no color perception; central scotoma 10° by 20° , surrounded by a clear zone of 20° by 10° horizontal. Atrophy of nerves of both eyes, and nerves in right vessels mere threads.

BURNETT.

REIK (494) gives the histories of two cases of retinitis associated with diabetes, in which in one case what is considered the typical yellowish-white dots were seen near the temporal margin of the disk; and in the immediate vicinity of the macula was found a round white atrophic patch, and near by two or three small hemorrhages. In the other there were no hemorrhages, but the white dots were present in one eye in great numbers; in the other eye the disease was less pronounced.

BURNETT.

XX.—OPTIC NERVE.

495. GERMANN. A case of tumor of the optic nerve. *Zehender's klin. Monatsbl. f. Augenheilk.*, xxxix., p. 319.

496. HEINE. Sarcomatous metastasis in the nerve head. *Ibid.*, p. 326.

497. HIGGENS, CHARLES. Notes on a case of unilateral neuritis. *Lancet*, 1899, p. 1083.

498. DE LAPERSONNE. Optic neuritis associated with affections of the sphenoid and the posterior portion of the nasal fossæ. *Arch. d'ophth.*, xix., 9, p. 513.

499. NETTLESHIP. Retrobulbar optic neuritis. *London Ophth. Hosp. Reports*, xv., 1, p. 1.

500. POSEY. A report of a case of complete monocular blindness following an injury to the head, attended by full restoration of vision. *Philadelphia Med. Journ.*, Aug. 19, 1899.

GERMANN'S (495) patient was a girl of eighteen. Her left eye had gradually grown prominent for two years, and finally vision was lost. The tumor was removed from before together with the eye. Behind the ball an enlargement of the optic nerve was found which passed over into a large dense tumor mass which filled the entire orbit. Then the tense grayish-blue wall of the

tumor appeared traversed by numerous vessels. Microscopically the tumor proved to be an angiosarcoma with foci of myxomatous degeneration.

HEINE'S (496) interesting case of sarcoma metastasis of the disk is unique in the literature. The tumor was seen ophthalmoscopically in life, and was supposed to have proceeded from pulmonary metastases of a sarcoma of the back.

HIGGENS'S (497) patient came under treatment with a neuritis of the right eye. The cause was first thought to be carious teeth, and these were removed, but without effect. The general condition became worse, and blindness of the right eye was followed by loss of vision in the left while the ophthalmoscopic picture remained unchanged. Only in the last days of life did a slight hyperæmia appear. At the autopsy there was found basilar meningitis, and marked swelling of the optic nerves and chiasm, with secondary atrophy.

ABELSDORFF.

DE LAPPERSONNE (498) reports observations of unilateral choked disk following affections of the ethmoid and sphenoid sinuses but not being accompanied by the usual signs of the latter affections, such as severe neuralgia, photophobia, spasm of the lids, and erysipelatous redness of the skin over the bridge of the nose. In the first case there was a sarcoma of the sphenoid with infection of the sinus, in the second a suppuration in the upper posterior portions of the nasal cavities, and in the third a suppurative inflammation of the rhino-pharyngeal cavity. In all these cases the choked disk remained unilateral and was to be regarded as an infection neuritis.

V. MITTELSTÄDT.

NETTLESHIP (499) gives a provisional classification of cases of retrobulbar optic neuritis, and the notes of a number of interesting cases which illustrate the different types.

I. *Idiopathic Family*—where the disease starts in the nerve itself.

II. *Symptomatic Family*—where the disease is communicated to the nerve by the surrounding tissues.

Of the idiopathic family two groups may be distinguished:

(a) That in which only *one* optic nerve is affected, which forms by far the largest class.

(b) That in which *both* optic nerves are affected.

He further divides group (b): 1. Cases which resemble group (a), but suffer one or more subsequent attacks like the first, and affecting the same eye or alternating between the two; and which

are complicated by loss of power or sensation in the limbs, that may be temporary, but often settles down into something permanent. (2) Cases characterized by rapid failure of one eye, followed shortly by similar failure of the other, and by quick and good recovery of both, without nerve complication or recurrence of blindness. The *onset* of the disease is rapid but not sudden; thus distinguishing it from embolism or arterial thrombosis or possible hemorrhage into the sheath.

The *field* is invaded in various degrees, but the central part is always affected, the scotoma often spreading out into a fan from the fixation point, but not in the same sector of the field in all cases. In hysterical amblyopia a central scotoma is very rare, but an interesting case is recorded in which it was present.

The *light sense* is impaired.

Spontaneous *pain*, or pain caused or increased by movement or pressure on the globe, is a very common sign, and it usually precedes the loss of vision, and ceases when or soon after this occurs.

The direct reflex action of the *pupil* to light is lowered.

Ophthalmoscopic changes in the idiopathic group are usually present almost from the first, though they may be slight; whilst in some of the worst symptomatic cases no change whatever can be detected in the disk for some weeks. Later on there is almost always pallor of the disk.

It is a disease of the most sexually active period of life, it being most frequently met with between the ages of twenty and forty, and during that period women are more than twice as subject to it as men.

Amongst the causes, exposure to cold, gout, influenza, typhoid fever, and malaria are mentioned; syphilis very rarely is the cause in the idiopathic group, but accounts for at least one half of the symptomatic cases Nettleship has collected. There is often also a history of marked functional or organic disease of the nervous system. It may be easy or difficult to distinguish between an idiopathic and a symptomatic case. In the symptomatic family, pain when it occurs is worse and more lasting; the ophthalmoscopic changes are delayed; paralysis of the cranial nerves and signs of bone disease at the base are fairly common; whilst in the idiopathic family symptoms of chronic disease of the brain or spinal cord are far less frequent.

Prognosis for sight in the idiopathic family is good on the

whole, but an attack of acute retrobulbar neuritis, single, or, if double, with much delayed symmetry and generally ending in partial or complete recovery, should always cause anxiety as to the future onset of *disseminated sclerosis* or some other disease of the cord—not tabes.

In the symptomatic group the prognosis is usually less hopeful.

In the case reported by POSEY (500) a man was struck over the left eye by the head of a child in play. The man was stunned and suffered much pain at the time, but in a few hours recovered. At the end of thirty-six hours the pain returned and vision began to fail as if a veil had dropped before his eyes from above downward. At the end of the fifth day he was totally blind. The nerve head was paler than its fellow and there was a venous pulse, the veins for some distance from the disk totally collapsing at each diastole of the heart. No arterial pulsation. Under vigorous treatment of rest, leeches, purgation, and diaphoretics he began to have a return of vision, which progressed until at the end of a week it reached normal, the last to disappear being a central scotoma. Posey is inclined to locate the lesion at the roof of the sphenoid cells, and due to inflammation rather than an effusion of blood.

BURNETT.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

501. CRAMER. On an iron splinter in the eye. *Zeitschr. f. Augenheilk.*, ii.

502. LEWINSOHN. On the removal of foreign bodies from the cornea. *Berl. klin. Wochenschr.*, 1899, No. 37.

503. UHTHOFF. Demonstration of two remarkable cases of magnet operation on the eye. *Allg. med. Central-Zeitung*, 1899, No. 57.

504. UHTHOFF. A case of unilateral retinitis from the glare of an arc light, followed by traumatic neurosis. *Zeitschr. f. Augenheilk.*, ii.

505. TORNATOLA. A note on the therapy of shot injuries of the eye. *Report of the XV. Italian Ophth. Congress*, Turin, 1899.

506. SCIMENI. Subretinal cysticercus. *Ibid.*

507. DE VINCENTIIS. On a cysticercus in the vitreous. *Ann. di Ottalm.*, xxviii., 1.

508. KENNON. A report of sixteen cases of foreign body (iron or steel) in the globe. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1899.

509. BICKNELL. Foreign body in the iris. *Ophth. Record*, July, 1899.

510. SNELL. On the removal of a fragment of steel from the retina with the electro-magnet. *Brit. Med. Journ.*, 1899, p. 335.

CRAMER (501) reports an interesting case of iron splinter in the eye. The foreign body had entered the upper part of the lens, and later, as the traumatic cataract progressed, it sank down to the lower part. The brown lens masses gave the iron reaction with ferrocyanide of potassium and hydrochloric acid. At the time of operation the iron present in the lens was in an oxydized form and was not affected by the magnet. After extraction, vision with the correcting glass was $\frac{2}{10}$.

In UTHOFF'S (503) first case it was remarkable that a bit of iron weighing only 0.006 caused a visible deflection of the needle in Asmus's sideroscope. Although the lens was perforated by the foreign body a total cataract did not develop, and the opacity first caused diminished somewhat, leaving $V = \frac{1}{3}$.

UTHOFF'S (504) patient, a man of thirty-three, was inspecting an arc light and had his right eye closed. Suddenly without warning the current was closed, and immediately the patient saw a dark spot in the field of the left eye, and became dizzy. A relative scotoma was found extending about 10° from the point of fixation, and there was slight metamorphopsia. Ophthalmoscopically a number of yellowish-red points were found scattered about the macular region. The excitation threshold (Förster's photometer test) was but slightly altered in the region of the scotoma, but the perception of minimum differences in luminosity (Mascan's disk test) was much lessened. It was noteworthy that a traumatic neurosis appeared afterwards.

TORNATOLA (505) regards all shot injuries of the eye as anti-septic, the entering foreign body being sterile. The only danger lies in a secondary infection of the wound, and therefore when the perforation has taken place through the sclera the conjunctiva should be sutured over it.

KRAHNSTÖVER.

SCIMENI (506) successfully removed a cysticercus from the eye. The diagnosis was made early with the ophthalmoscope, and the parasite which lay beneath the retina could easily be removed. The retina became attached again, and the ophthalmoscopic

picture was normal except at the spot where the cysticercus had been. Vision improved from $\frac{1}{60}$ to $\frac{1}{2}$. According to the author's belief, an operation is always indicated, since spontaneous recovery does not take place, in his opinion. KRAHNSTÖVER.

In DE VINCENTII'S (507) case a cysticercus in the vitreous was followed from its first appearance, the patient refusing to have it removed. When finally the eye was enucleated two cysts were found in the vitreous, one small without a trace of a parasite, the other five times as large, containing the fully developed living parasite. From the microscopic conditions of the cysts and adjacent vitreous, the author concludes that the cysticercus first occupied the smaller cyst and thence migrated to the other. The cause of the migration would seem to have been the thickness of the wall of the first vesicle which allowed the parasite no room for growth. In cases in which the wall cannot be pierced the parasite dies. Thus are to be explained the observations of encapsulated cysticerci. KRAHNSTÖVER.

KENNON (508) gives the histories, in more or less full detail, of sixteen cases of pieces of iron or steel removed from the eye. Where the foreign body is in the vitreous, the chances for eventual vision are bad. In only one case was it $\frac{5}{60}$. Where the foreign body is in the anterior chamber, the prognosis is very favorable for a return of vision eventually to the normal. The same is true in a degree when the body is in the lens. He considers the Haab magnet safer than the forms of instrument that have to be introduced into the eye. Some of these cases (six) have been reported before. BURNETT.

The foreign body in the iris in the case reported by BICKNELL (509) was a bit of stone, $2 \times 1 \text{ mm}$, adherent to the anterior iridic surface close to the pupillary margin. The pupil was small and rigid. It had entered the eye some nineteen years ago. $V = \frac{2}{60}$, and no complaint. BURNETT.

SNELL (510) was able to remove through a scleral incision a splinter of steel which had passed through the iris and entered the retina without causing opacity of the media. Vision rose to $\frac{5}{6}$, and only a small scotoma corresponding to the point of injury remained.

XXII.—OCULAR AFFECTIONS IN GENERAL DISEASES.

511. WINTERSTEINER. A case of metastases in the ocular muscles from a carcinoma of the breast. *Klin. Monatsbl.*, Sept., 1899.

512. HIRSCHL. On the sympathetic pupillary reaction and on the paradoxical light reaction of the pupils in progressive paralysis. *Wiener klin. Wochenschr.*, 1899, No. 22.

513. KOENIG. Alternating mydriasis in a case of cortical cerebral paralysis. *Deutsche Zeitschr. f. Nervenheilkunde*, xv.

514. SARADETH. A case of puerperal metastatic panophthalmitis. *Münch. med. Wochenschr.*, 1899, No. 11.

515. BELIOWSKY. On the influence of the genital apparatus in the woman on diseases of the eye. *Wjest. Ophth.*, 1899, 4-5.

516. BOCCHI. Nicotine and alcohol amblyopia. *Report of the XV. Italian Ophth. Congress*, Turin, 1899.

By alternating mydriasis we understand a dilatation of the pupil which alternates in the two eyes. KOENIG (513) reports a case occurring with cerebral paralysis in childhood—a disease with which this phenomenon has not been seen previously. Reaction to light and in convergence were normal. From a consideration of the literature and his own cases he comes to the following conclusions:

Alternating mydriasis is a rare phenomenon observed both when pupillary reaction is normal and when it is abnormal.

It is observed chiefly in cases of organic disease of the central nervous system, less frequently in cases of functional disturbances, and very rarely in persons who have no nervous affection.

If the pupillary reaction is normal and there are no other indications of organic nervous disease, the presence of alternating mydriasis is not to be considered necessarily of bad portent.

When there is a difference in the width and in intensity of reaction in the two pupils, as in unilateral reflex iridoplegia, an alteration in the general illumination may produce what to the superficial observer would seem to be this phenomenon (pseudo-alternating mydriasis).

HIRSCHL (512) presents observations on the sympathetic pupillary reaction in cases of mental disease, and the paradoxical light reaction of the pupils.

By sympathetic reaction we understand the dilatation of the pupils due to excitation of the sensory nerves. The test is made by pricking or pinching the cheek or by applying a moderately strong faradic current to any portion of the body, when usually the pupil dilates promptly. The author found that in patients with mental disorders, apart from progressive paralysis, the

sympathetic reaction was almost always present, being absent only in cases of chronic alcoholism.

In paralytics the sympathetic reaction was almost always absent when there was Argyll-Robertson pupil. The sympathetic reflex is wanting often in progressive paralysis when the light reaction is completely preserved. Thus it appears that the sympathetic reaction is almost always lost before the light reaction. The paradoxical reaction of the pupils appears (1) with the Argyll-Robertson pupil when the sympathetic reaction is preserved, and (2) with the Argyll-Robertson pupil and lack of sympathetic response, when in conjunction with insufficiency of the interni a movement of abduction is made when the eyes are illuminated.

SARADETH (514) reports a case of panophthalmitis in a primipara of thirty-four with a delicate constitution. The sight of the right eye was lost, but the patient recovered otherwise completely in the course of three months.

This case is an exception, for with metastatic irido-choroiditis the prognosis as regards life is usually bad. Of 105 cases of puerperal ophthalmia found in the literature by Axenfeld there was a fatal outcome in 75.

BELIOWSKY (515) observed a case of punctate infiltration of the cornea with hypopyon and $T + 1$ in connection with dysmenorrhœa and oöphoritis, a case of neuro-retinitis after suppression of the menses, a case of bilateral optic neuritis after the sudden onset of the climacteric period, and a case of perforating corneal ulcer in the ninth month of pregnancy which recovered after an induced abortion. In all these cases the author supposed a causal connection to exist between the genital affection and the eye disease.

HIRSCHMANN.

The fact that in Italy, at least, a far greater percentage of cases of amblyopia are due to tobacco than to alcohol, leads Bocchi (516) to propose a separation of the two varieties, since, in his opinion, retrobulbar neuritis due to the abuse of alcohol is never seen.

KRAHNSTÖVER.

BOOK NOTICES.

III.—**Das Sarkom des Auges.**—By Dr. R. PUTIATA KERSCHBAUMER, of St. Petersburg. A beautifully gotten up octavo volume of 285 pages and 16 exquisitely executed large lithographic drawings on 10 (mostly double) plates. J. F. Bergmann, Wiesbaden, 1900. Mk. 16.

The authoress, well-known by former publications of scientific and practical character, successfully conducted, for a number of years, an ophthalmic hospital at Salzburg, Austria. Besides having personally treated numerous cases of ocular sarcoma, she had the good fortune that Prof. Hubert Sattler put at her disposal, for the work under consideration, the anatomical collection and case histories of the ophthalmic clinic of the University of Leipzig.

PART I. deals with the anatomy and histology of the ocular sarcomas.

Chapter 1 gives a connected description of these growths according to their **pathology**, classifying them into angio-sarcoma, melano-sarcoma, leuco-sarcoma with hematogenous pigmentation, fusiform sarcoma, combination tumors, and degenerative processes, 30 pages.

The classification according to their **site** (Chapter 2) distinguishes diffuse, or flat, and circumscribed sarcomas.

Chapter 3 deals with the primary (injuries, inflammations, vascular changes) and the consecutive affections (inflammation, glaucoma, changes of the lens) in sarcoma.

PART II. gives 67 very clearly presented case-histories (170 pages). We note

7 cases of **diffuse** sarcoma.

9 cases of **epibulbar** sarcoma, of which we mention : Case 8, epibulbar sarcoma, originating in a birthmark ; enucleation ; relapse ; death by metastases. Case 9 : Epib. melano-sarcoma,

originating in a pigmented nævus, which from childhood had been noticed as a small black patch near the nasal margin of the cornea. It remained unchanged until the thirty-seventh year of the patient, when it increased rapidly, was removed, relapsed, developed into a large tumor, extending into the orbit. Exenteration of orbit. Six years later, when last seen, no relapse.

2 cases of sarcoma of the **iris**.

8 cases of sarcoma of the **ciliary body**, extending interiorly by invasion of the contiguous structures, exteriorly through the lymph sheaths of the anterior ciliary and the vorticosae veins.

41 cases of sarcoma of the **choroid**, of which 28 were situated in the posterior polar region, 7 in the equatorial zone, and 6 were too far advanced to recognize their starting-point.

PART III. Clinical Conditions. The authoress adopts the usual four stages : 1. Development [non-irritative or latent]. 2. Increase of eyeball tension [glaucomatous]. 3. Extrabulbar propagation. 4. Metastases.

In 12 fatal cases the following metastases were noted : brain, 3 ; brain and liver, 3 ; liver, 1 ; liver and lungs, 5. Death occurred at the earliest period three months after the operation, in most cases during the first year, only in 4 later. One case, as mentioned above, was living six years after the operation.

The authoress cites a case of Prof. H. Sattler's. During the enucleation of a shrunken eye, Prof. S. noticed that an intra-ocular sarcoma had perforated the posterior part of the sclerotic. At once he supplemented the enucleation by an extensive exenteration of the orbit. The patient is still under observation, and thus far, seven years, no relapse has occurred.

As inflammatory complications, acute and chronic choroiditis, irido-cyclitis, and even sympathetic ophthalmia are on record. They originate in foci of decaying tumor-substance, which penetrates into the tunics of the eye, causing the above inflammations. The authoress details a case from her own practice. The left eye of a girl of ten years was hurt with a stick, inflammation followed, and when first seen the eye had been blind a year. In the last four months it had been more or less painful. In the right eye, pain and impairment of sight had been present for six days, rapidly increasing. Serous iritis, with posterior synechiæ and optic neuritis ; S = fingers at $1\frac{1}{2}$ m. Immediate relief and gradual recovery after exenteration of the left orbit ; discharged with S $1\frac{6}{12}$. The tumor of the left eye was a melano-sarcoma,

which had perforated the posterior part of the sclerotic and filled the whole orbit. Authors think that the cause of the sympathetic inflammation in these cases is not the injury and its consequences, but a "phlogogenic substance." The author discusses the differential diagnosis and treatment in a scholarly manner.

A bibliography of 784 numbers is appended, as well as a page of "errata," where the reader is expected to read "Ponas" for "Pana."

The sixteen figures constitute an atlas, presenting the chief features of ocular sarcoma. They are all instructive, some unusually so, for instance Figs. 6, 8, 11, 15, 16; others might have been omitted, for instance Figs. 2, 3, 5, 13.

Dr. Kerschbaumer's book is a valuable contribution to the ontology of the eye, and will be read by every ophthalmologist with satisfaction and profit.

H. K.

IV.—**Die Neurologie des Auges.** Ein Handbuch für Nerven- und Augenärzte. By Dr. H. WILBRAND and Dr. A. SÄNGER. First vol., second part. Wiesbaden: J. F. Bergmann, 1900. 388 8vo pages, with 88 text-figures. \$2.

We can only add that the second part, concluding the first volume of this exhaustive treatise, sustains the high opinion we conceived of the first part, reviewed in vol. xxviii., p. 121. This second part contains: 5. **The Ptosis of Syphilis**, and among other subjects treats of the gummous inflammation of the periorbita in the superior orbital fissure and in the tissue of the cavernous sinus; the ptosis in the basal syphilitic affections of the third pair; the ptosis of the basal syph. meningitis; the changes in the radical, nuclear, supra-nuclear, and cortical regions of the third pair; furthermore, the topical diagnosis of the site of the functional disturbances of the third pair in syphilis; the ptosis isolated or combined with other structures supplied by the oculo-motor communis.

6-8. Ptosis from hemorrhage, softening, and abscess of the brain.

9. Ptosis in basal affections: tumors, inflammations, fractures, and sinus thrombosis.

10-11. Traumatic ptosis. Ptosis in cerebral tumors, multiple neuritis, Landry's paralysis, and polymyositis.

15. Functional ptosis: hysterical, and in recurrent paralysis of the third pair.

Chapter viii. The **relation of the facial nerve to the eyelids**, dealing with spasmodic and paralytic affections.

The industry with which this work has been prepared is astounding. Being the most thorough book of reference we know of, it is not likely that in search of anything it will ever disappoint us, but even if it has the character of a dictionary or an encyclopedia, just its thoroughness draws out our attention and interest in reading select chapters for deeper information. H. K.

V.—**The Refraction of the Eye**, including a complete treatise on ophthalmometry. A clinical text-book for students and practitioners. By A. EDWARD DAVIS, Adjunct Professor of Diseases of the Eye in the New York Post-Graduate Medical School, Assistant Surgeon to the Manhattan Eye and Ear Hospital, etc. With 119 engravings, 97 of which are original. New York : The Macmillan Co., 1900. 8vo, 431 pages, well printed. \$3.

The illustrations are very neat, mostly outline drawings. The work treats of refraction, and somewhat also of motility (strabismus and insufficiencies), essentially in the same manner as the many modern text-books on this scientifically most interesting and practically very important subject. Ophthalmometry is presented in full detail of the construction and use of the ophthalmometer. Throughout the book the description of each variety of refractive error is supplemented by illustrative cases, for a thorough practical drill. The author distinguishes anisometry from antimetry: the former meaning unequal, but the same kind of refraction in the two eyes, the latter opposite refraction; the one myopic, the other hyperopic. An appendix describes the improvements of the ophthalmometer made recently, also Reid's and other ophthalmometers. Davis's treatise can be heartily recommended as a first-class elementary school book in refraction.

H. K.

VI.—**Skiascopy**. A treatise on the shadow test in its practical application to the work of refraction, with an explanation in detail of the optical principles on which the science is based. 8vo, 217 pages, with 69 illustrations and 4 plates. Published by *The Keystone*, the organ of the jewelry and optical trades, Philadelphia, 1899. \$1.50.

This is a book the oculist as well as the optician will be benefited by reading. Besides the optical principles of skiascopy, it teaches, in minute detail, with the aid of numerous drawings, all

the manipulations employed in this test, and furthermore the description and illustration of the various devices and apparatus now in use. A working acquaintance with the optician's work is indispensable for the oculist, and he can acquire a good deal of it from this book.

H. K.

VII.—The American Year-Book of Medicine and Surgery.

A yearly digest of scientific progress, etc. Under the general editorial charge of GEORGE M. GOULD, M.D. Surgery. 8vo. Philadelphia: W. B. Saunders, 1900.

The ophthalmological section of this book comprises 58 pages, prepared by Hansell and Reber of Philadelphia. It contains the usual brief references to papers of importance classified in such a way as to be easy for reference.

W. A. H.

VIII.—A Pocket Medical Dictionary, giving the pronunciation and definition of the principal words used in medicine and the collateral sciences. By GEO. M. GOULD. Fourth edition, revised and enlarged. P. Blackiston & Son, Philadelphia, 1900. 12mo, 837 pages, 30,000 words. \$1.00.

This little book, printed in small type, on thin paper, the words in antique, the explanations in roman, is carefully put through the press. It is copious, up-to-date, reliable, and handy.

H. K.

MISCELLANEOUS NOTES.

RESIGNATIONS AND APPOINTMENTS.

Prof. C. SCHWEIGGER has resigned the chair of Ophthalmology at the University of Berlin, which he has held since the death of A. v. Graefe in 1870. He will continue his work as the Editor of the German edition of these ARCHIVES.

Prof. J. VON MICHEL, of Würzburg, has been appointed his successor.

Prof. CARL MELLINGER, of Basel, has been appointed Professor in Ordinary.

Professor WOLFRING, of Warsaw, has resigned.

Dr. A. GRUENOUW, of Breslau, has received the title of Professor Extraordinary.

C. DEVEREUX MARSHALL has resigned the Curatorship at the new Royal London Ophthalmic Hospital, and

W. T. LISTER has been appointed his successor.

Prof. CESARE PAOLI succeeds Prof. L. GUAITA at the University of Siena, Italy.

HOSPITAL NEWS, SOCIETY MEETINGS, ETC.

OPENING OF THE NEW BUILDING OF THE ROYAL LONDON OPHTHALMIC HOSPITAL.—On June 27, 1899, the new hospital in the City Road was opened by the Duke and Duchess of York, the foundation stone of which had been laid by the Prince of Wales in 1897.

The hospital was opened for the treatment of patients at the beginning of September.

XIIIth. International Medical Congress, Paris, Aug. 2-9, 1900. Section of Ophthalmology.

The three subjects for general discussion, published in our last issue, have been increased by four others, viz. :

1. The actual status of our knowledge on the mechanism of accommodation. Introduced by Professor Hess (Marburg).

2. Reform in the designation of visual acuteness. Introduced by Javal.

3. On glaucoma following cataract operations. Introduced by Wicherkiewicz (Warsaw).

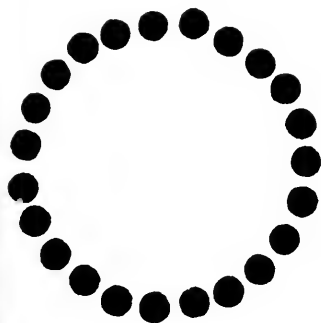
4. The treatment before and after the operations of cataract. Introduced by Dr. Schiötz. The introductory addresses will not be read at the meeting ; they will be handed, printed in extenso, to the members of the section. Only a short abstract will be given of the addresses, after which the discussions will begin at once.

Voluntary contributions will be read and discussed after the discussions of the general subjects. The secretaries will give a short abstract in two of the three languages of the Congress (French, German, English) in which the paper was not read ; for instance, when a paper is read in German, the secretaries give a résumé of the paper in French and English. The Secretary (Dr. Parent, 26 Ave. de l'Opéra) asks authors to send the MSS. of their papers as soon as feasible.

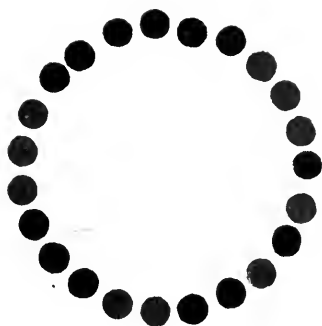
The two American medical conventions, the fifth triennial congress of **American Physicians and Surgeons**, to be held at Washington, May 1st-3d, and the meeting of the **American Medical Association** at Atlantic City, N. J., June 5th to 8th, promise to be well attended and full of interest.

The **German Ophthalmological Society** will meet at Heidelberg September 13th, 14th, and 15th.

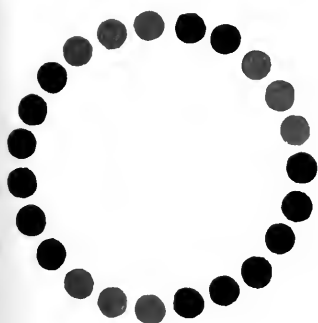
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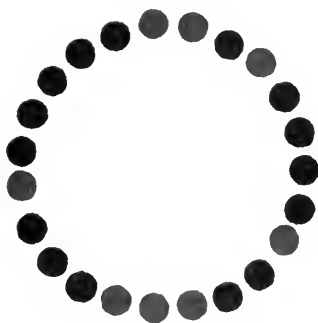
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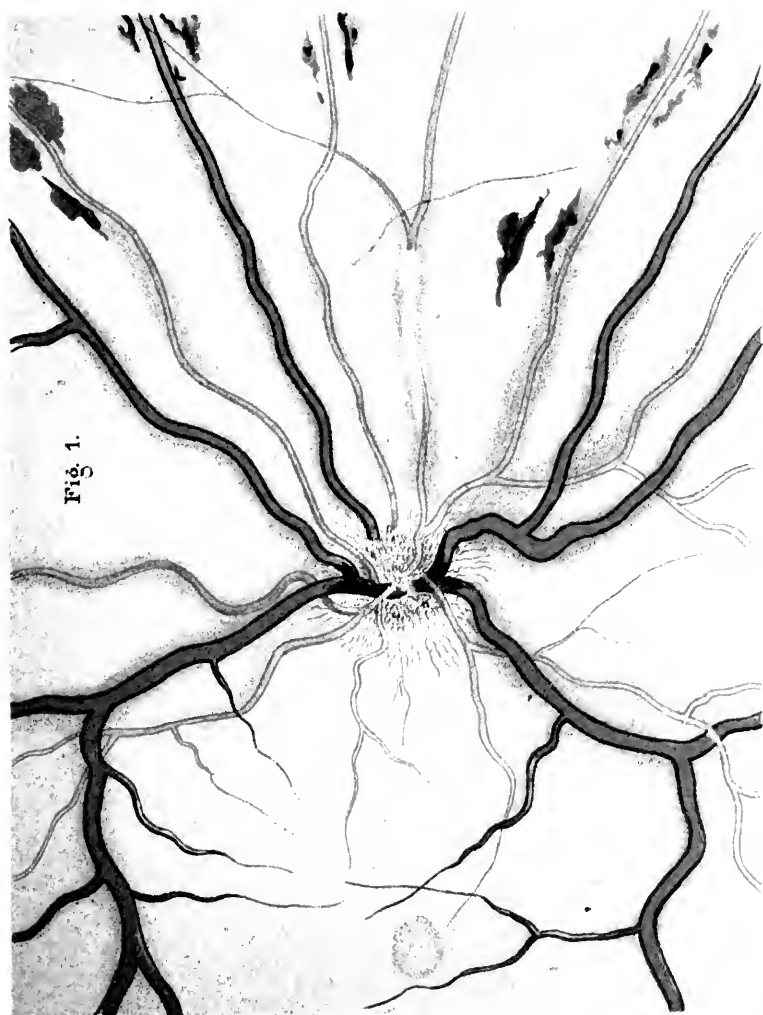








Fig. 1.

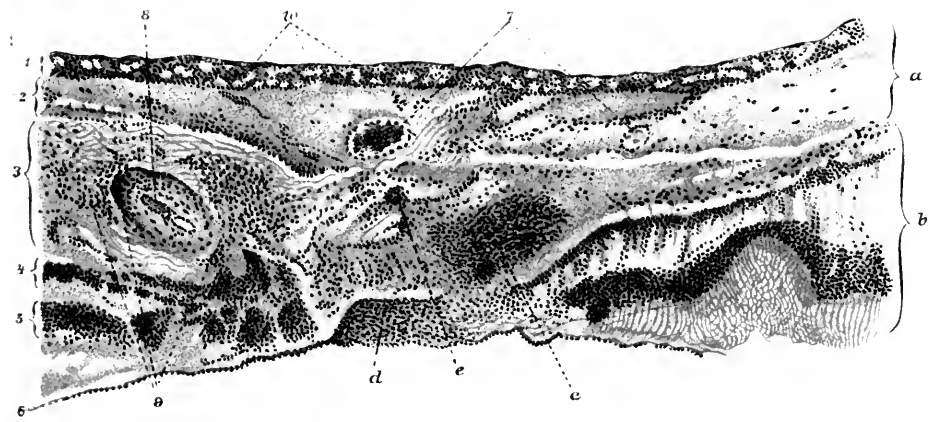
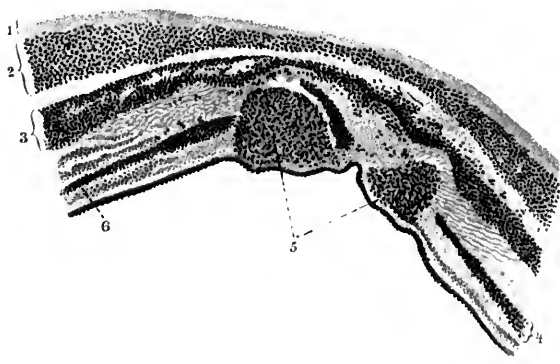


Fig. 2.



ARCHIVES OF OPHTHALMOLOGY.

THE ORDER OF DEVELOPMENT OF COLOR PERCEPTION AND OF COLOR PREFERENCE IN THE CHILD.¹

BY WARD A. HOLDEN, M.D., AND K. K. BOSSE, B.S.,
NEW YORK.

INTRODUCTION.

A THEORY as to the order in which perception of colors was acquired by the human race in its development was offered years ago by Gladstone. In his *Studies on Homer's Perception and Use of Colours* (1858), Gladstone announced that in the Homeric poems terms which were supposed to express color, in reality seemed to express rather a system of light and dark than a system of color. One of the curious ideas in Goethe's *Farbenlehre* appealed to Gladstone, since it indicated a point of likeness to Homer, for Goethe also had a scale between light and non-light. "Next to light," said Goethe, "a color appears which we call yellow; another appears next to the non-light which we call blue; mixed equally they form red." Magnus, examining other ancient writings, such as the Hebrew scriptures, the Vedas, and the Zend-avesta, found that words supposed to denote color were used as loosely in these writings as in the Homeric poems. And the theory was then fully launched that archaic man had no perception of color, but recognized differences in luminosity alone; later, man acquired perception of red, orange, and yellow, which Gladstone and Magnus loosely classed as the more luminous colors; and, finally, man came to know green, blue, and violet,

¹(Read in abstract before the Ophthalmological Section of the New York Academy of Medicine, April 15, 1900.)

which were considered to be the less luminous colors. Homer, Gladstone believed, had got, after a fashion, his red and orange; but the child of three in the nursery to-day was supposed to have a wider perception of color than had the keenly observant Greek poet.¹

Such was the Gladstone theory, in proof of which little has been offered, and in opposition to which much has contemptuously been said.

To-day the trend of evolutionary investigation has changed, and attention has been turned from following the course of the changes which occur in the species, to the task of tracing the course of the changes, more or less analogous, which occur in the development of an individual animal or a single cell. So now child study is generally indulged in, and, as might be expected, there have been published various accounts of color experiments on children, most of which have been carried on for a period of several months with a single child as a subject. But scarcely in any two of these accounts has the experiment employed had the same purpose or the children the same age, and the results naturally are hopelessly confusing. Furthermore, we believe that none of the tests used was adapted for determining whether the infant actually perceived colors or not.

Preyer was the first to undertake extensive experiments in this regard. In his book *Die Seele des Kindes* (1881), he records the results of experiments carried on for more than twelve months with a single infant, beginning at the end of the second year of life. His procedure was to show the child a few colors and teach him their names, new colors being added from time to time, and later to ask the child to pick out a color which he named or to name a color which he picked up. The greatest percentage of correct responses was for yellow, then for brown, red, violet, black, rose, orange, gray, green, and blue, in the order named.

Miss Shinn [*Notes on the Development of a Child* (University of California Studies), p. 49] made somewhat similar tests with an infant of eighteen months, and obtained quite different results.

¹ Gladstone, "The Color Sense," *The Nineteenth Century*, vol. ii., p. 366, 1877.

Binet (*Revue Philosophique*, xxx., p. 583) separated Preyer's two procedures, recognizing them to be tests for quite different ends, and with a child of thirty-two months made one series of experiments in which the child was urged to select a color that was named, and another series in which the child was urged to name a color selected. The results, tabulated separately, differed in each case from those reported by Preyer.

Baldwin then described in his book on *Mental Development* what he called a dynamogenic method of studying responses to various stimulations, which was to obviate all the difficulties of earlier methods. He experimented with an infant from the beginning of the ninth month, by placing bits of colored blotting-paper, one at a time, at different distances from the infant and noting the frequency of reaction to the different colors at different distances. His results were expressed in a formula in which "the strength of dynamogeny," D , was equal to $\frac{c}{d}$; c being the color and d its distance from the infant. He found the order of attractiveness to be blue, white, red, and green; yellow not having been used. His method, however, has been criticised adversely by reviewers and his results in no way agree with our own. Besides these, there are many less pretentious observations scattered through the literature which we need not discuss here.

In an attempt to clear up this confusion we examined by tests that appeared suitable more than two hundred children of various ages selected from among the brightest and least shy inmates of a dozen nurseries, hospitals, and asylums in New York, and we wish here to express to the officers of these institutions our appreciation of their kindness in affording us all the facilities desired.

I.

THE ORDER IN WHICH COLOR PERCEPTIONS ARE ACQUIRED.

It is evident that up to this time no one who has studied color perception in young infants has used a test by which it was possible to demonstrate that the infant actually per-

ceived particular colors, for in every case in which an infant reacted to a colored object it could not be proven that the reaction was not due to the difference in luminosity between the test object and the background rather than to the particular hue of the test object. For a reliable test of color perception in young infants, difference in luminosity between the colored object and the neutral background must be eliminated. This point may be explained as follows: Let, for example, a square of light red paper be laid upon a background of dark gray. The square will differ from the background both in hue and luminosity, *i. e.*, both in color and in brightness. If a person who from disease has lost perception of red views this square of red paper, or if a person with normal eyes views it indirectly so that its image falls upon the periphery of the retina, which normally does not perceive colors, the red hue will not be perceived and the red square will appear gray. But the gray in this case will appear lighter than the dark gray of the background, and hence the square will be recognized, just as a light gray square on a dark gray background would be recognized by the normal eye.

When, however, we place a square of red paper upon a gray background of exactly the same luminosity, the red-blind eye will perceive the red square as neutral gray, lying on a background of similar gray, and, if the square has not a perceptible outline, the background will appear of a uniform gray, and the presence of the square will not be recognized.¹ Therefore, when a square of red paper on a gray background of the same luminosity is recognized by an eye, we know that the eye perceives red.

THE TEST.

The test we used for determining the earliest perception of a color in young infants consisted in presenting to the infant a piece of tissue paper of that color 15 *mm* square, upon

¹ The effects of viewing a colored object on a gray background of the same luminosity have been described in detail in the paper by Holden: The fluttering produced by the juxtaposition of certain colors and of black and white.—These ARCHIVES, xxvii., 1.

a background of gray paper having the same luminosity as the colored paper, and observing whether the infant made an effort to grasp the colored square. If it made an effort to grasp the colored square it must have perceived that color.

It is difficult to prepare a gray background having exactly the same luminosity as a given color, and, furthermore, the colors themselves, especially violet, vary greatly in relative luminosity under different degrees of general illumination. Therefore, it is expedient to use a large sheet of gray paper which is graduated, being dark gray at one end and light gray at the other. The so-called Rembrandt mounts now popular with the photographers are well adapted for this purpose. By shifting the colored square from one end of the gray sheet toward the other end, it is possible for the practised eye, with the lids somewhat pinched together, readily to discover a point at which the gray background has exactly the same luminosity as the colored square which lies upon it. Tissue paper was used for the squares because it can be obtained in colors corresponding closely to the colors of the spectrum and because the thin margins are scarcely perceptible.

Tests with young infants are successful only when the subject is wide-awake and in good humor, and when it is accustomed to seeing new objects and new people. The infants in asylums are apt to be shy. Still, we obtained reliable records of tests with thirty infants between six and twelve months of age. The routine method was as follows:

A large sheet of graduated gray paper was laid upon a sheet of stiff cardboard and the dark end held before the infant. Several pieces of white paper of different sizes were placed successively on the dark gray and the infant was urged to pick them up. After the infant had entered into the spirit of the test a flat piece of red tissue paper 15 *mm* square was laid upon the dark end of the gray sheet, and when the infant grasped for it, the sheet was withdrawn and the square of red paper pushed along until it lay upon a gray of equal luminosity as seen from the infant's view-point. If, when the sheet was presented again, the infant grasped

for the red paper, it was recorded as having perception for red. If a positive result was obtained with red, the other spectral colors were tried in succession, the test being stopped whenever the infant became inattentive or the reactions doubtful. If some colors caused a reaction while others did not, control tests were made after an interval or on another day. In infants that soon showed signs of fatigue, subsequent tests began with blue or violet for reasons that will appear later.

THE RESULTS OF THE TEST WITH THIRTY INFANTS BETWEEN SIX AND TWELVE MONTHS OF AGE.

The results may be stated in a few words. Before the age of six months definite reactions were not obtained. With precocious infants of six months and average infants of seven or eight months a prompt reaction was usually obtained to red, orange, and yellow, but as regards green, blue, and violet there was considerable difference in different infants. In some infants no reaction at all could be obtained to these colors; in others there was, after repeated efforts, a sluggish and uncertain reaction to all; and in a few a reaction was obtained to all except blue. With infants of nine months there was usually prompt reaction to red, orange, and yellow, and more sluggish reaction to green, blue, and violet. With infants between ten and twelve months there was often equally prompt reaction to all colors. When the test results positively it means that the color is perceived as differing from gray. When the test results negatively it may mean either that the color cannot be distinguished from gray or that the color is not attractive to the infant. As we shall see later, when preference tests are discussed, green, blue, and violet are not attractive to young infants, so it is probable that the failure to react promptly to these colors was in part due to a lack of interest in them, although it seems true also that the perception of colors of the red end of the spectrum, of long wave length, is acquired a little earlier than the perception of colors of the violet end of the spectrum, of shorter wave length.

Generalizing, we may say that the precocious infant may perceive and react to all the colors of the spectrum as early as the seventh month, and that the average infant will perceive and react to them all by the tenth month, the colors of the red end of the spectrum being reacted to a little earlier than the colors of the violet end.

II.

COLOR PREFERENCE, OR THE ORDER OF ATTRACTIVENESS OF COLORS, AT DIFFERENT AGES.

To determine the order of attractiveness of colors, ribbons of the six fundamental spectral colors: red, orange, yellow, blue, green, and violet, were offered to the child, who was urged to pick them up one at a time. Some of the children unquestionably exercised choice, and were recorded as responding positively to the test, while others picked up the ribbons in sequence or at random, and were recorded as responding negatively.

For the purpose of rendering the complex tabulated results more comprehensible we will first present the general results in outline.

It was found that all those infants between seven and twenty-four months of age who were recorded as responding positively, picked up red first, orange and yellow second or third, and green; blue, and violet, fourth, fifth, or sixth. In other words they selected the colors approximately in the order of the spectrum, beginning at the red end. It was found also that in the first age group, seven to fifteen months, almost all the infants positively exercised choice. In the second age group, sixteen to twenty-four months, only about one quarter of all the infants responded in a positive manner. In the third age group, two to three years, the percentage of children exercising choice diminished still more, it being found in only three out of twenty-six. Two of these three still selected the colors very closely in the order described for the previous groups, while the third selected them in almost exactly the opposite direction of the spectrum, beginning with blue and ending with red.

In the fourth age group, three to four years, there was again a greater percentage of children positively exercising choice, but only one chose the colors beginning with red, while many others began with blue. About an equal number exercised what we may call "atypical choice," which will be described later on. In the next four age groups, from four to eight years, the percentage of children with positive choice increased steadily. There was a steady increase also in the number of children who began their selection at the blue end of the spectrum and ended it at the red. Only an isolated instance of red preference occurred during this period, and the atypical cases decreased to about seven per cent. Thus blue preference became almost universal at the age of eight.

The last age group, eight to thirteen years, presented about the same features as were shown at the end of the preceding group. A slightly higher percentage of children exercised positive choice, and this was almost without exception blue preference.

The order of blue preference underwent certain intrinsic changes with advancing age which will be mentioned later.

THE TEST.

As colored test objects we used satin ribbons, one inch wide and a foot long, corresponding closely in hue and relative luminosity to the six fundamental spectral colors. The ribbons were placed side by side, an inch apart, upon a sheet of medium gray pasteboard. No particular rule was observed in arranging the different colors except to alternate a color near the blue end of the spectrum with one near the red end, and to avoid putting the duller colors at the ends of the row. With the ribbons arranged in this way, all portions of the test field attracted the attention about equally. An inch space between the ribbons was sufficient to allow each color to stand definitely by itself and to make it impossible for the child to grasp more than one ribbon at a time.

The cardboard on which the ribbons were placed so that they pointed towards the child was held about a yard away

and brought quickly into reaching distance, while the child was urged to pick up the ribbon it liked best. The ribbon chosen first was taken away from the child, and the rest brought together to fill the gap and again presented. This procedure was repeated until all the ribbons but one had been picked up. The order was noted by recording in a line the initial letters of the colors as they were selected.

We have already mentioned what we have called positive and negative responses to the test. The distinction was made as follows: The child who responded positively, showing actual choice, would look over all the ribbons critically and deliberately select one. When this was taken away and the remaining ribbons presented, there would be a critical selection of a second ribbon, and so on. When such a child was put through the test several times in immediate succession it soon began to pick up the ribbons at random. Hence the results of the first tests only were recorded or, if we wished to verify the first results, the subsequent tests were made after a considerable interval or on other days, when the later results would be found to agree closely with the first.

The child who responded negatively paid little attention to the ribbons, but rather watched the experimenter for suggestions as to choice,—any suggestion, such as pointing towards a ribbon, mentioning the name of a color, or the like, immediately being acted upon; when no suggestions of this kind were given, the ribbons were picked up usually in sequence, beginning with those next to the child's right hand if this hand were used, or with those at the child's left if the left hand were used. Occasionally, one of the ribbons near the centre would be picked up first, and following this the ribbons to one side, and later those to the other, would then be picked up in sequence. If the ribbons were thrown in a heap, the child usually picked up each time the ribbon which was most easily reached. There was naturally no definite order of selection of colors here, and tests on different days always led to widely different results.

After a little observation one usually saw in a moment

whether the response should be classed as positive or as negative, but in doubtful cases the test was repeated.

The cases of atypical choice, mentioned above, are most frequent at the age when red preference is passing through indifference over into blue preference. The child in these cases chose deliberately one color, or at the most two, and was indifferent to all the rest, picking them up in sequence or at random. The colors chosen were always orange, yellow, or green, the middle and most luminous colors of the spectrum. These cases also were classed with the positive results, so that the latter comprise what we shall call: red preference, blue preference, and atypical choice.

Up to the fifth year the percentage of boys examined was about equal to that of girls; after the fifth year the children examined were mostly girls. No difference in responses was noticed that would suggest a sex distinction, and hence both were classed together.

NUMERICAL CLASSIFICATION OF THE VARIOUS KINDS OF REACTION TO THE TEST.

In Table I. are recorded for each age group the number of positive and negative responses and the total number of children examined, and again the percentage of positive and negative responses. Under positive responses are included the three groups: red preference, blue preference, and atypical choice.

The percentage of positive responses (fifth column) is seen to be high in early life—amounting to 81 per cent. in the age group seven to fifteen months. It then drops rapidly to a minimum of 12 per cent. in the age group two to three years; and gradually rises again until it reaches a maximum of 93 per cent. in the age group eight to thirteen years. The table shows a break in the gradual rise when we reach the age group six to seven years. It may be mentioned in possible explanation that the seventeen children in this age group were all in a single institution, where the children were unused to visitors and shy.

TABLE I.

Age Group.	Number of + Responses.	Number of - Responses.	Total Number Examined.	Per Cent. of + Responses.	Per Cent. of - Responses.
7 to 15 months.....	13	3	16	81	19
15 months to 2 years....	5	13	18	28	72
2 to 3 years.....	3	23	26	12	88
3 to 4 years.....	9	18	27	33	67
4 to 5 years.....	7	13	20	35	56
5 to 6 years.....	10	7	17	58	42
6 to 7 years.....	7	10	17	41	59
7 to 8 years.....	17	2	19	89	11
8 to 13 years.....	38	3	41	93	7

In Table II. are recorded the relative percentages of the three varieties of positive choice as found in each age group.

TABLE II.

Age Groups.	Per Cent. of Red Preference.	Per Cent. of Blue Preference.	Per Cent. of Atypical Choice.
7 to 15 months.....	100	0	0
15 to 24 months.....	100	0	0
2 to 3 years.....	67	33	0
3 to 4 years.....	12	44	44
4 to 5 years.....	0	86	14
5 to 6 years.....	0	80	20
6 to 7 years.....	14	57	29
7 to 8 years.....	0	94	6
8 to 13 years.....	0	93	7

It is seen here that red preference is universal in the first two age groups, seven to fifteen and fifteen to twenty-four months. It then rapidly decreases, and has practically disappeared at the end of the fourth year. Only one case of red preference was found after the fourth year, that of a boy in the age group six to seven years. Since in this age group there are only seven positive responses, this anomalous case unduly affects the relative percentages.

Blue preference begins with 33 % in the age group two to three years, and steadily increases to 93 % in the last group. Atypical choice begins with 44 % in the age group three to four years and decreases to 7 % in the last.

The next two tables, III. and IV., require rather more explanation. The vertical columns refer to the order of choice, and the numerals in the horizontal line opposite the initial of a color indicate the number of times that particular color was chosen first, second, third, etc., according to the column in which it stands, in the age group indicated at the right. Thus the first horizontal line of numerals in table III. indicates that of the eighteen children between seven and twenty-four months who responded positively, fourteen selected red first, one selected it second, and three selected it third. Except in the age group two to three years, only a single test of the order of selection was tabulated, since the records of subsequent tests did not alter the character of the results. But in the age group two to three years, there were but two cases of red preference and one case of blue, and, therefore, the results of three trials at long intervals are tabulated in order to make the figures appear more representative. The single case of red preference in the age group three to four years, and the single one in the age group six to seven years, have been omitted from the tables.

TABLE III. (RED PREFERENCE).

	Times Selected First.	Times Selected Second.	Times Selected Third.	Times Selected Fourth.	Times Selected Fifth.	Times Selected Sixth.	Age Group.
R.	14	1	3	7 to 15 and 15 to 24 mos. }
O.	1	6	11	..	..	..
Y.	3	9	6	..	..	..
G. ....	..	..	..	9	6	3
B. ....	..	..	..	..	9	9
V. ....	..	..	..	9	3	6
R.	4	..	2	2 to 3 yrs. }
O.	1	1	2	1	1	..	
Y.	1	4	1	..	..	..
G. ....	..	..	..	..	2	4
B. ....	..	1	1	4	..	..
V. ....	..	..	..	1	3	2

TABLE IV. (BLUE PREFERENCE).

	Times Selected First.	Times Selected Second.	Times Selected Third.	Times Selected Fourth.	Times Selected Fifth.	Times Selected Sixth.	Age Group.
R.	3	2 to 3 yrs. }
O. ....	..	..	I	..	2	..
Y. ....	..	..	..	3	..	..
G. ....	..	..	2	..	I	..
B.	3	..	..	..	..	..
V.	3	
R.	I	3	3 to 4 yrs. }
O. ....	..	..	..	I	3	..
Y. ....	..	..	..	2	I	I
G.	3	..	I	..	..	..
B.	I	2	I	..	..	..
V.	3	I	
R.	3	2	4 to 5 yrs. }
O. ....	..	..	I	I	2	I
Y. ....	..	..	I	3	..	I
G. ....	..	3	I	..	..	I
B.	I	I	2	I	..	..
V.	4	I	
R.	2	I	3	2	5 to 6 yrs. }
O. ....	..	..	I	2	2	3
Y.	I	I	I	I	2	2	
G. ....	..	3	I	2	I	I
B.	3	I	2	2	..	..
V.	4	3	I	
R.	I	3	6 to 7 yrs. }
O. ....	..	I	2	..	I	..
Y. ....	..	..	..	3	I	..
G.	2	I	..	..	..	I
B. ....	..	I	I	I	I	..
V.	2	I	I	
R.	I	2	5	I	7	7 to 8 yrs. }
O. ....	..	3	..	3	5	5
Y. ....	..	..	4	3	6	3
G.	I	4	4	4	2	I	
B.	2	7	4	I	2	..	
V.	13	I	2	
R.	3	6	7	11	6	2	8 to 13 yrs. }
O. ....	..	2	3	7	8	15
Y. ....	..	I	3	4	13	14
G.	I	12	3	9	6	4	
B.	11	7	14	I	2	..	
V.	20	7	5	3	

In summing up the general results, the negative responses or indifference to colors will first be mentioned. These, as

Table I. shows, were most frequent in the age group two to three years, at the time when blue preference begins to take the place of red. They would seem, therefore, actually to indicate a want of preference for particular colors at that age. We recognize, however, that one familiar with the way in which children respond to tests of this sort may feel justified in contending that the negative responses were due in part to the child's not understanding what was wished of it, to its inconstancy of attention, to fatigue, and the like.

The significance of the positive results is clear, however, and as they could in no way be vitiated by the negative results, we will not discuss further the actual meaning of the latter.

The first part of Table III. is particularly interesting. It shows that red is most likely to be chosen first by all infants under two years of age, and that yellow is a little more likely to be chosen second than orange, which is, on an average, third. Green, blue, and violet are the least attractive colors at this age.

In the age group two to three years the same general tendency is still recognizable, but blue has become more attractive.

The one child in the age group three to four years who was found to have red preference chose the colors at two separate trials in the following order: Y., R., O., B., G., V. The boy of six followed the exact order of the spectrum.

The figures in Table IV. show the intrinsic changes which the order of attractiveness in the cases of blue preference undergoes in passing from the early age groups to the later.

Blue and violet are everywhere more frequently chosen either first or second than any other color; but only in the last age groups, seven to thirteen years, does there seem to be a more decided preference for violet than for blue. The change of position of red is noteworthy. In the early age groups it is last, or near the last, but in the later age groups it gradually advances, until in the last two age groups it is most frequently chosen fourth.

Green, yellow, and orange, in the earlier age groups, are distributed about evenly among the last three places. In

the later age groups, however, yellow and orange tend to be chosen last of all.

CONCLUSION.

The order of development of perception and the order of attractiveness of colors in the young infant, in whom the process of selection is almost instinctive or physiological rather than the result of training or reflection, support by analogy singularly well the Gladstone theory of the development of color perception in the human race, so that this theory may have a certain value as a general evolutionary theory, although, of course, we must go down much lower in the mammalian scale than to primitive man to find the beginning of color perception.

To one who has interested himself in the matter of color perception the questions naturally present themselves: What are the functions of the various colors in nature? Why does the child react to colors differently at different ages?

We may perhaps go a little way toward tentatively answering these questions.

The colors of animal life must be left out of consideration here, since they have undergone innumerable changes for specific reasons, as Wallace and others have shown. But, in general, the predominating, or what we may call the background colors in nature are the blues and greens—the colors of the sky, the sea, the woods and the fields. The yellows and reds, complementary to the background colors, are found in smaller masses, and serve to call attention to particular objects, such as the blooming flower and the ripened fruit. These colors we may call the accent colors in nature.

The colors of the red end of the spectrum are generally conceded to be exciting or irritating when presented in large masses. Some of the lower animals are thrown into a frenzy at sight of them. The greens and blues, on the contrary, are known to be quieting and restful.

The young infant, it would seem, responds to the exciting colors in a physiological or almost instinctive way, choosing the colors of the red end of the spectrum before those of

the blue. As psychical development proceeds, and the child becomes more distinguished from the animal, and mental processes dominate the earlier more physiological reactions, we find first an indifference to all colors, and a little later, as a rule, a dislike for the exciting reds and yellows, and a preference for the less exciting colors of the blue end of the spectrum.

This is the typical change which occurs in the order of attractiveness as the child grows older, and this takes place probably without respect to environment or training.¹

In a certain number of children the change from red to blue preference is not so direct, and after the period of greatest indifference to all colors, at the age of two or three, there is for a time a modified indifference, in which one or more of the middle and most luminous colors of the spectrum—orange, yellow, and green—is preferred, while indifference to the rest is maintained.

At the age of eight, blue or violet preference is almost universal, but red has begun to advance from the lower end of the scale. In adults, as others have found, the end colors of the spectrum—blue, violet, and red—are the attractive colors, while orange, yellow, and green, which in childhood are preferred for a time by a certain number of children, become the “disliked colors.”

AN APPENDED NOTE ON MATCHING COLORS.

The ability to match colors correctly is a matter rather of discrimination than of perception of color and, as such, lies outside the scope of this paper; but since many of the attempts to study the color sense in children have been based upon this test, we may devote a few words to it here for the sake of completeness.

In brief, we found by many experiments that the untrained child, as early as the third or fourth year, except

¹ Matrons of infant asylums have informed us that a young infant will often be cross all day if dressed in a gray frock, but contented and happy if dressed in a bright red frock. Children from two to four years old are much less affected by the color of their dress. It is commonly observed in kindergartens that the younger children prefer the red playthings, while the older children prefer the blue.

when palpably color-blind, matches fairly saturated colors with great accuracy, blundering usually only in confounding blue and violet. But when worsteds of less saturated hue—tints and shades—were given to the child to be matched with the saturated test-worsteds, the results were very different. Many tints and shades were indeed placed with the saturated test-worsteds of the same hue, but not infrequently we found a disposition to match the worsteds according to luminosity rather than hue.

Thus pale tints of red, such as pink and salmon, frequently were matched with the more luminous colors—orange and yellow; and, on the other hand, dark shades of red and brown were frequently matched with the less luminous colors—blue and violet.

When the child is five or six years old, this disposition to match colors according to luminosity is lost, and the matching even of tints and shades is done usually with considerable accuracy, although there may still be a tendency to confound blue and violet, which is outgrown only later.

ON TUBERCULOSIS OF THE EYE.

BY DR. ERNST LUBOWSKI, KATTOWITZ.¹

(*With two figures on Plate XIII. of Vol. XXXV. German Edition.*)

Abridged Translation by Dr. WARD A. HOLDEN.

ABSOLUTE glaucoma following tuberculosis of the interior of the eye is an extremely rare condition, and although the literature of ocular tuberculosis is particularly rich, there is very little in regard to glaucoma in connection with tuberculosis, and I was able to find only three cases in which there was increased intraocular tension, hypotony being the rule. These cases, however, differ from mine in that the increased tension was not a prominent symptom and the glaucoma did not mask every sign of tuberculosis, as in my case. The case, therefore, seems worth reporting and the more so on account of the peculiar extension of the tuberculous process in the ball.

B. N., aged twenty-eight, a secretary, came to the clinic October 9, 1888, with the following history :

Early in June the right eye became greatly inflamed, with severe pain, diminution of vision, and the appearance of colored rings about a flame. Under the continued use of atropine the vision diminished until, at the end of August, even perception of light was lost. The pain then passed off for a time, but returned and became so severe that the patient came to our clinic.

St. pr. : L V = $\frac{5}{6}$; accommodation, visual field, and fundus normal.

Right eye: The ball is of normal form and size and the tension is increased to + 3. The cornea is surrounded by a rosy vascular zone 3 mm broad. The anterior chamber is shallow, vessels

¹ From Prof. SAMELSOHN'S Clinic at Cologne.

are seen in the iris, the pupil is large and vertically oval. The reflex from the interior is of a smoky green hue, the vitreous is diffusely cloudy, and the fundus cannot be seen. On account of the intense pain the eye was enucleated October 10th. The course of healing was normal. The eye remained hard even after enucleation. It was fixed in Müller's fluid and hardened in alcohol. Its measurements were: Sagittal diameter 25 *mm*, transverse diameter 23 *mm*, and vertical diameter 24 *mm*. After being divided in a sagittal plane it presented the following macroscopic appearance (Fig. 1, Pl. XIII.): The cornea and sclera appear normal. The anterior chamber is shallow and in its lower part almost obliterated; the remaining cavity is filled with a cloudy, grayish, homogeneous mass. The iris in almost its entire lower half rests on the posterior surface of the cornea. The lens in its lower half correspondingly has a greater curvature than in its upper half. The retina and choroid lie in position on the sclera. The choroid apparently is not thickened; the retina, however, is greatly thickened in its inferior half and particularly about the disc. The thickened portion of the retina differs in color from the remainder and is covered with a layer of fibrin which appears behind the lens also. The vitreous is uniformly cloudy and of a grayish-green color. The optic disc is excavated but otherwise the nerve appears normal.

Microscopic. In sections from the middle of the eye the following conditions are found:

The cornea is slightly thickened from swelling of its fibrillæ and dilatation of its lymph-spaces. The epithelium is somewhat thickened near the sclero-corneal junction and beneath this thickened epithelium are new-formed blood-vessels and a small-celled infiltration. Infiltrations are also seen about the canal of Schlemm.

The membrane of Descemet is everywhere intact, but to some extent deprived of its endothelium. The anterior chamber is partly filled with a homogeneous coagulated mass free from cells and detritus.

The iris is infiltrated and thickened, and its vessels are dilated and their walls degenerated. There are many nodular infiltrations in the iris which at first glance suggest tubercles, without having their characteristic structure, but at the root of the iris typical tubercles are seen. The pupil is blocked by a fairly thick cellular membrane, which continues into the posterior chamber.

The ciliary body is congested and infiltrated, and in and among the ciliary processes are a number of typical tubercles.

The lens seems normal except for its change in form.

The choroid in its lower half exhibits a diffuse infiltration but no tubercles.

The most advanced changes found are in the retina, indicating this as the part primarily affected. In its anterior segment, it is completely degenerated and shows no trace of normal retinal elements, consisting only of a fibrous mass inclosing clumps of pigment. Posterior to this, the retina is transformed into a network of fibres with necrotic cells and detritus. From the equator backward, the retina is very greatly thickened, and consists of a dense hyperplastic connective tissue infiltrated diffusely with small cells and containing numerous tubercles of various sizes. Of the retinal structures, there only remain a few groups of small cells representing the nuclear layers, and diffusely scattered pigment. In the neighborhood of the disc the retina is thickened to six times its normal diameter, and exhibits a remarkable structure (Fig. 2). The outer layers are well preserved. Müller's fibres are pressed apart so that vacuoles are left—a sign of œdema. Farther inward there is a broad layer of vascular tissue in which lie quantities of typical tubercles, with numerous giant and epithelioid cells, surrounded by spindle-formed cells. Neither here nor elsewhere in the eye are there signs of retrograde metamorphosis in the tubercles. The individual tubercles are separated by tracts of darkly stained small cells. These conglomerations of tubercles make an interesting picture at the hilus of the central vessels, where they fill up a fairly deep excavation of the disc.

The upper portion of the retina is of normal thickness and of normal structure, except for accumulations of lymphoid cells here and there that are not typically tuberculous.

Staining for tubercle bacilli was successful, the bacilli being found in greatest number near the disc. Sections of the optic nerve stained by the Weigert-Pal method showed pronounced atrophy of the nerve fibres.

To sum up, the patient was a man of twenty-eight who had become completely blind in the right eye within three months as the result of a violent inflammation. The pain returning, the blind eye was enucleated later. What the na-

Fig. 1.

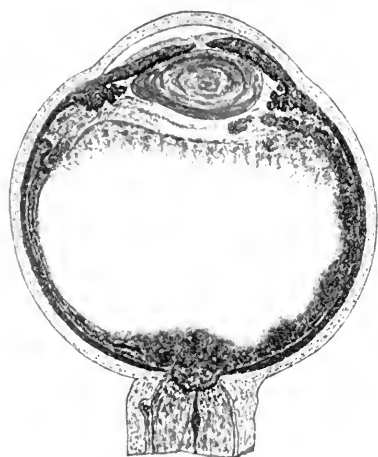
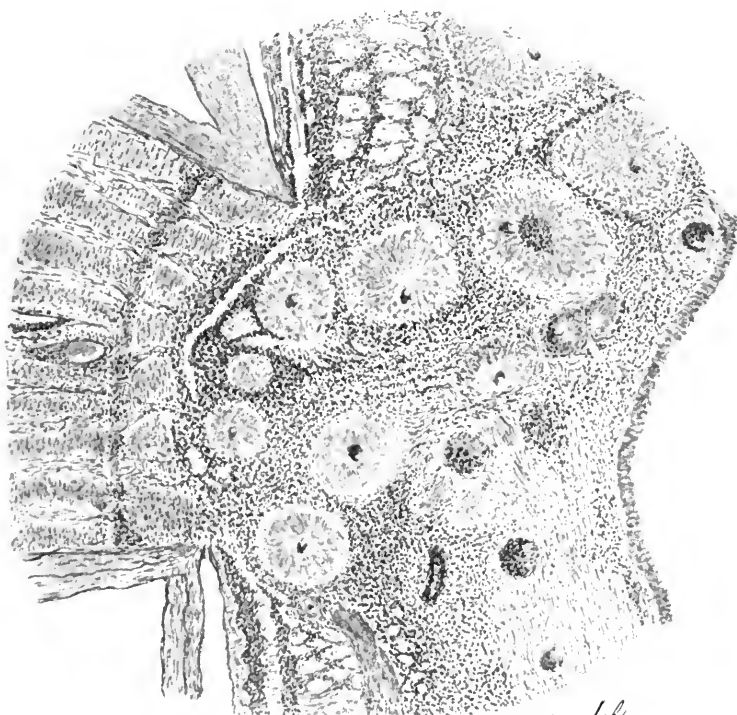


Fig. 2.



Dr. Liebowitz del.

ture of the inflammation was cannot now be told with certainty. Although the patient's description would suggest glaucoma, the fact that atropine was prescribed would indicate iridocyclitis. When admitted to our clinic, the eye presented the picture of absolute glaucoma.

Increased tension in the course of tuberculous affections of the interior of the eye has been observed a few times in recent years.

Haab (*Graefe's Archiv*, xxv.) described a case of tuberculous tumor of the choroid, which appeared under the clinical picture of iritis serosa. The tension was normal at first, but as the tumor grew larger the tension became increased.

A second case was reported by Bongarty ("Ueber die Ausbreitung der tuberculösen Infection im Auge," *Inaug. Dissert.*, Würzburg, 1891). A patient of nineteen had gradually lost the sight of one eye a year before and now had an iridocyclitis in the other. Later a tuberculous nodule appeared at the ciliary margin of the iris in the second eye, the inflammatory symptoms increased, and the intraocular tension was frequently increased. Nothing is said as to the further course of the disease.

A third case was reported by Wagenmann (*Graefe's Archiv*, xxxiv., 4). The patient was a man of sixty-two, whose eye was blind from an injury received fifty-one years before. The eye, which had remained quiet all this time, suddenly became inflamed, and a chronic iridocyclitis developed, with increased tension. In spite of proper treatment, the symptoms increased in severity, the tension increased, the anterior chamber became shallow, and the iris pressed forward. An iridectomy was of temporary benefit, but in a few days the old condition became re-established, the coloboma was blocked with exudation, and the tension and pain increased so much that enucleation became necessary. The pathological examination revealed a tuberculous tumor of the choroid behind the ciliary body, projecting fungus-like into the vitreous.

Our case differs from the others in that the pathological changes induced by the tuberculosis brought about the clinical picture of absolute glaucoma, while in Bongarty's case,

in which the diagnosis was assured by the appearance of the tuberculous nodule in the iris, the increased tension was only incidental, and in the two other cases the clinical picture of intraocular tumor was dominant.

Increased tension in cases of tuberculous affection of the iris and ciliary body is, as the literature shows, of very rare occurrence.

From the arrangement of the tubercles in our case, it seems probable that the original affection was a tuberculous iritis or iridocyclitis, from which a secondary infection of the entire lower half of the retina took place. This is unusual, as extension from the ciliary body usually involves the choroid and not the retina.

My thanks are due to my former teacher and chief, Dr. Samelsohn, for putting this material at my disposal.

A CASE OF BILATERAL SO-CALLED COLOBOMA OF THE MACULA LUTEA.¹

BY DR. KIMPEL.

(*With two drawings on Plates I.-II. of Vol. XXXVII. German Edition.*)

Translated by Dr. WARD A. HOLDEN.

THERE has recently been reported a case of bilateral coloboma of the macula lutea by Dr. Katharina Kastalsky, of Moskow.² Through the kindness of Professor Hess I am able to report a similar case recently seen in our clinic.

H. M., aged twenty-three, came to the clinic complaining of extreme myopia.

His family is healthy, except for the fact that his father and his two elder brothers are also highly myopic and have a squint. His vision had been poor since his earliest childhood, and, according to his mother's account, he began to squint immediately after his birth. He had had great difficulty in school because of his poor vision. He had never worn glasses and had never had any inflammation of the eyes, and his vision, so far back as he could remember, had never been any better than at present.

The general examination showed the patient to be a strongly built man, without any malformations or anomalies of development.

Examination of the Eyes.—There is marked convergent strabismus. The patient cannot perform fixation with either eye. In attempting to look straight forward the left eye turns in until the nasal margin of the cornea reaches the inner commissure, and

¹ From the University eye clinic at Marburg.

² German Edition, December, 1897.

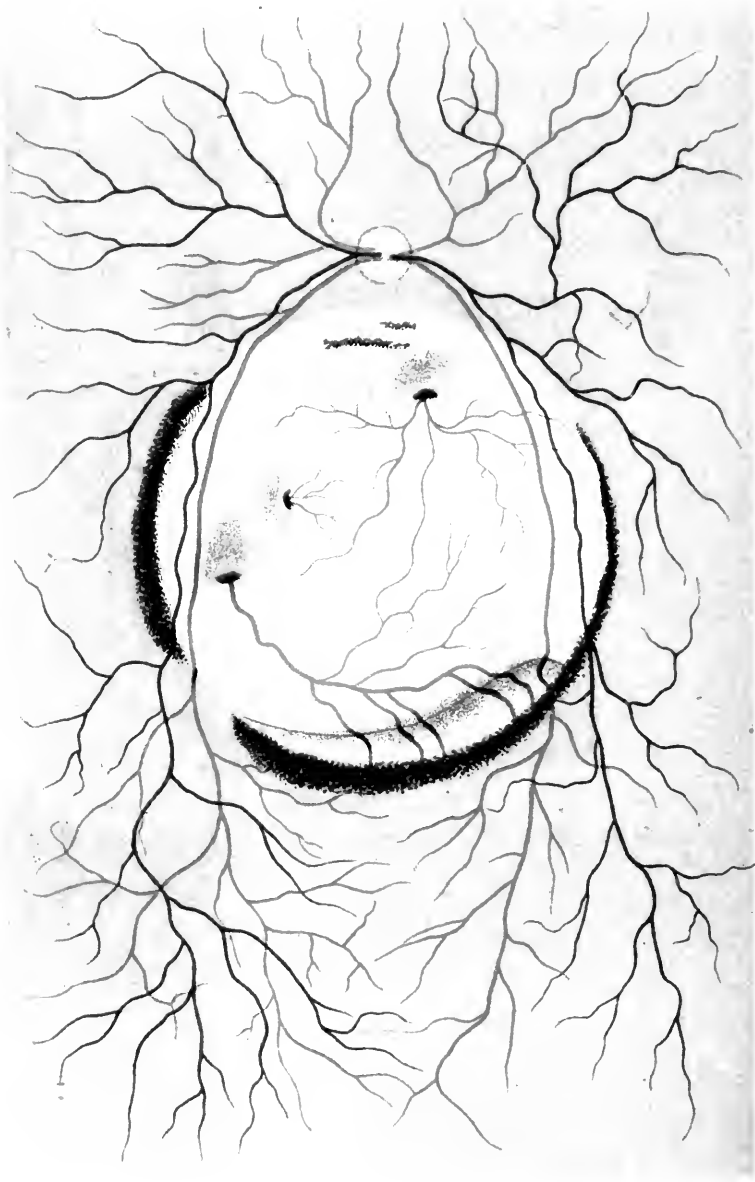
also turns slightly downward, while the right eye turns in, but not so much as the other. (Tenotomy of both internal recti, which was done later, diminished this convergence but slightly.)

When the right eye was covered, the left eye in its attempt to fix maintained its previous position, as did also the right eye when the left was covered. In both eyes at times there were nystagmus-like twitchings. If the object fixed is carried from the median line toward the left, the left eye, when the right is covered, follows until it looks directly forward. Beyond this it does not proceed, while the patient states that he still sees the object equally well when it is carried farther to the left, although the eye no longer follows it. If a further effort is made to follow the object, nystagmus-like twitchings appear, and the eye passes a little beyond the middle line and then turns back. The right eye acts in an analogous way. When the object to be fixed is carried downward, in uniocular vision the eye turns downward only when the object has been carried down to an angle of 45° . When the object is moved upward this is not the case.

Otherwise the eyes present no peculiarities. The balls are not especially prominent. The irides are developed normally. The refractive media are clear and transparent. Retinoscopy shows myopia of 15 D in the left eye and 14 D in the right. R, with -14 , V = fingers at 1.5 m; L, with -15 , V = $\frac{3}{30}$. With either eye Jaeger No. 3 was read at 6 cm without glasses.

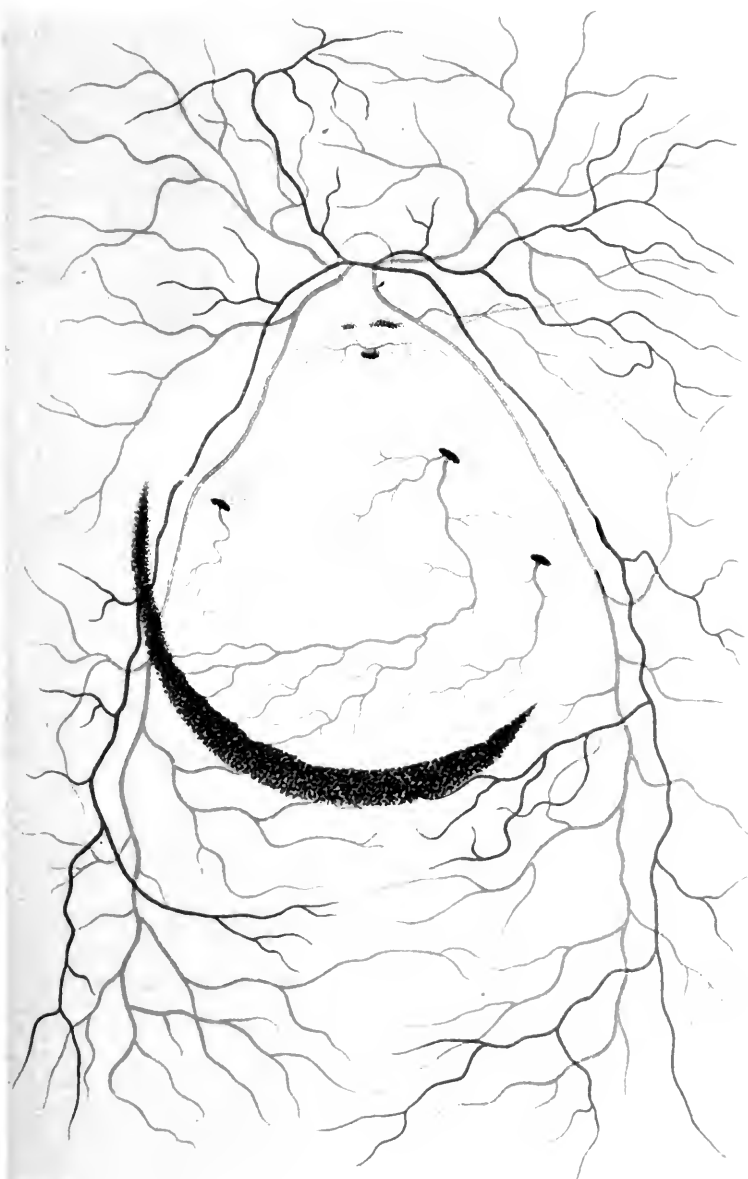
Fundus of the left eye (Pl. I.): the nerve-head, otherwise of normal form and color, presents to its temporal side a sharply limited gleaming white sector and a narrow myopic crescent. The retinal vessels present no peculiar features.

About one-half disc-diameter temporally from the nerve-head begins a round patch, lustrous and yellowish-white, 10 disc-diameters across, occupying the region of the macula and its neighborhood. This area is sharply limited from the surrounding retina, which is of normal appearance. Above and below, the area is bordered by a narrow zone of punctate brownish-black pigmentation, which to the temporal side of the area becomes somewhat wider. Here the white area does not pass over abruptly into the normal retina, but there is a transition zone of a dirty reddish-gray color. The area otherwise is free from pigment, excepting two small stripes near the disk. One got the impression that in the entire area the sclera itself lay bare. However, there were many vessels present. The retinal arteries and veins arising in the disc pass obliquely



linkes Auge.

Rechtes Auge





over the pale area, giving off small twigs. At the margin of the white area near the disc the vessels pass immediately and without arching into the area, but as they pass over the temporal margin they bend a little at the edge of the grayish crescent and again as they pass from this over to the normal retina. There are also numerous vessels which, entering the ball from behind, suddenly make their appearance on the inner surface of the sclera. They give one the impression of emerging from a shallow depression in the sclera, and they are apparently posterior ciliary arteries. The three main vessels give off many branches, some of which, passing over the gray crescent, disappear abruptly as they reach the red portion of the fundus.

Outside of this white area the retina shows no pathological changes.

The fundus of the right eye presents a symmetrical and similar white area agreeing with that in the left eye even to the smallest details. The disc differs somewhat from that in the left eye. Here there is a middle oval portion from which the vessels emerge. This portion is surrounded by a fairly pure white ring from which a tongue-like projection of the same color extends downward and outward. About one-half disc-diameter temporally begins a round, lustrous yellowish-white area of equal size and similar characteristics with that in the left eye. The crescentic transition area is wanting here, but there is a crescentic broadening of the pigment zone at the temporal margin of the white area, and a slight bending of the vessels can be made out where they pass over this zone. In the white area four ciliary vessels are visible.

A perimetric examination with a white test object 1 *cm* square showed the fields to be approximately normal. No scotoma could be made out. It should be noted, however, that the examination was very difficult since the patient was unable to fix accurately. For this reason no attempt was made to determine the color fields.

The conditions described seem to us to be specially interesting on account of their excessive degree and also on account of the clearness of the relations. Among all the

cases of "coloboma of the macula" that I have found in the literature, none has exhibited such extensive changes.

The case is certainly to be considered one of congenital anomaly—a pure developmental defect in a circumscribed portion of the uvea.

The pictures which we observe in cases of myopia of high degree and in cases of true inflammation are readily distinguished from the condition under consideration. Yet these two were the only affections to be considered in the matter of differential diagnosis. Our patient, it is true, suffered from high myopia which developed under a hereditary disposition. The conception of the white area as being due to atrophy of the coats of the eye, following myopic distension of the posterior segment, is opposed by the lack of pigment in the area. The narrow border of delicate pigment which partly surrounds the area cannot be regarded as having wandered from the entire atrophic area, and this view is opposed also by the nature, color, division, and arrangement of this pigment. In this case, moreover, there would be remains of choroidal tissue and especially choroidal vessels, but the few ciliary vessels that are present in no way present the characteristic arrangement and division of choroidal vessels.

The same reasons may be offered with great certainty in opposition to the view that this is an old choroiditic focus not related to the high myopia, with the further fact that similar foci are not found elsewhere in the fundus, and the fact that there is some bulging of the sclera in the temporal portion of the areas as evidenced by the curving of the vessels as they pass over it.

As was stated in the history, the patient was unable to turn his eye outward for more than a moment at a time, and therefore it was impossible to estimate by retinoscopy the difference in refraction between the normal retina and the ectatic area accurately in dioptries, although I assured myself that there was a considerable difference. Finally, against the idea of choroiditic foci may be urged the astonishing symmetry of the two areas, for no inflammation would have left results so similar in the two eyes.

Granting, then, that this anomaly is a congenital one, the question arises: To what intrauterine pathological processes did it owe its origin?

The old conception of Arlt, which was later adopted by Manz, Vossius, and others, that these so-called colobomas of the macula are due to an incomplete closure of the foetal ocular cleft, has in recent years been shown on embryological grounds to be untenable, as Schmidt-Rimpler, Hess, and others have pointed out. We may refer especially to the paper by Chievitz (*Archiv f. Anat. u. Physiol.*, 1890), "Investigations on the Development of the Area and Fovea Centralis Retinæ."

There remain, therefore, only two possible explanations: first, an intrauterine inflammation, a sclero-choroido-retinitis (Deutschmann); and, second, a purely developmental defect such as Hess has assumed for cases of this sort. (*Græfe's Archiv*, xxxiv. and xxxvi., 1.)

Against the idea of an intrauterine inflammation are the almost complete absence of pigment in the middle of the area, and the color and disposition of the pigment, and finally the symmetry of the two foci. The fact that the remainder of the retina is intact would hardly accord with the idea of an inflammation, for an inflammation violent enough to have destroyed the entire macular region would have left traces in the neighboring portions of the retina.

By exclusion we come to regard the condition as one of pure developmental anomaly. In the second paper by Hess, cited above, he describes the eye of an otherwise healthy albino rabbit, which presented a round white area 3-4 disc-diameters across, occupying the region of the macula and representing a deep, regular ectasia of the ocular sheaths. When examined microscopically, the ectatic portion of the sclera was found to be 0.03-0.04 mm thick; the choroid was absent in this region and only a few vessels were found here and there on the inner surface of the sclera. All the layers of the retina were thinned here, but were normal elsewhere. There was no evidence of inflammation.

The condition in our patient was evidently very similar to that found in the rabbit, excepting that the ectasia was

less marked in the former. The ophthalmoscopic changes in our patient could be explained satisfactorily by assuming histological changes similar to those found in the rabbit.

In conclusion I would express the hope that the designation, "coloboma of the macula lutea," which is unfitting since it suggests a relation to the foetal cleft, will henceforth be given up.

RETROBULBAR NEURITIS, WITH PERMANENT CENTRAL SCOTOMA, FOLLOWING THE TREATMENT OF EXTENSIVE BURNS WITH IODOFORM.¹

BY L. D. BROSE, M.D., PH.D.,

OCULIST AND AURIST, ST. MARY'S HOSPITAL, EVANSVILLE, IND.

(With two V. F. Charts.)

On November 19, 1897, I was asked by Dr. I. Wilton to see one of his patients who apparently within thirty-six hours had lost his eyesight. The **history** of the patient in brief is as follows: C. J., a married man, thirty-three years of age, and who had always enjoyed good health and eyesight, while following his occupation, that of steamboat cook, was injured, October 21st, on a gravel digger through an explosion of one of her boilers. The force of the explosion dazed him, and he was found with a piece of the boiler lying up against his back and badly scalded over the back of the body, arms, and legs. Beyond his burns he was not aware of other injury. He was conveyed to his home, where Dr. Wilton dressed his wounds with iodoform gauze. Because of free supuration it was necessary to renew the gauze dressing daily at first. Recovery, however, rapidly set in, so that at the time of failure of sight perhaps three fifths of the burned area had cicatrized. His vision, which has been stated as always good, became very dim on November 17th, and within twenty-four hours he was unable to distinguish light from darkness. Associated with failure of sight was dull frontal headache, continuing for a week or ten days. The urine gave a specific gravity of 1.014, was acid, and contained neither sugar nor albumin. Tobacco and alcohol, to which he has for years been daily addicted,

¹ Read before the Vanderburgh County Medical Society, February 20, 1900.

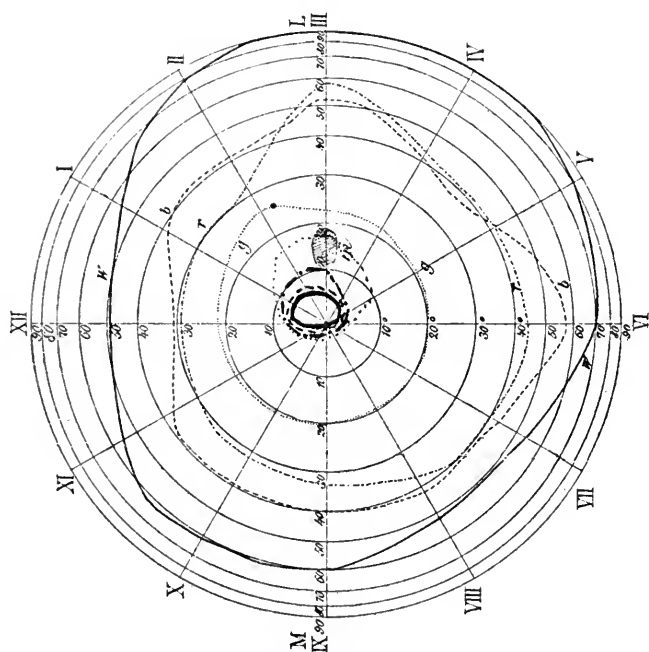
were proscribed by Dr. Wilton at his first visit. The general external appearance of the eyes was that of health, save for the pupils, which were dilated and irresponsive to light; and when the patient was placed before a window bright with daylight he still said he was in darkness. The tendon reflexes were normal, and all traces of syphilis were denied. With the ophthalmoscope the optic discs were found markedly swollen, with their margins blurred and everywhere very indistinctly defined. The veins of the fundus were full, but no hemorrhage or other lesion was found in any part of the retina or choroid. The iodoform gauze was directed to be discontinued, and the patient placed upon bichloride of mercury with tincture of gelsemium and belladonna.

On November 25th there was light perception with the left eye, but this was again lost by the following day and again recovered November 29th. On December 1st he was able with either eye to count fingers placed a couple of inches in front of him and directly in the line of vision. December 22d he could count fingers at four feet. The swelling of the optic discs disappeared slowly, and their outlines again became discernible with gradual improvement in sight, so that by June 5, 1898, vision was $\frac{15}{60}$. However, in testing, the letters would come and go, and he was conscious of a central shadow. The peripheral field of vision so far as made out was free, and its boundaries normal. On January 11, 1900, the date of my last examination of the patient, his vision with + 4. spherical was $\frac{15}{60}$, and the temporal sides of the optic discs were pale. The field of vision still gave an absolute central scotoma for white, with enlarging defects for blue, red, and green. Beyond the central color-blind area the colors were again properly recognized. The treatment in addition to that already mentioned was hypodermic injections of strychnia in increasing doses, hypodermic injections of pilocarpine sufficient for free diaphoresis, and mercurial inunctions. The latter, however, after two attempts, had to be early discontinued on account of rapid ptialism.

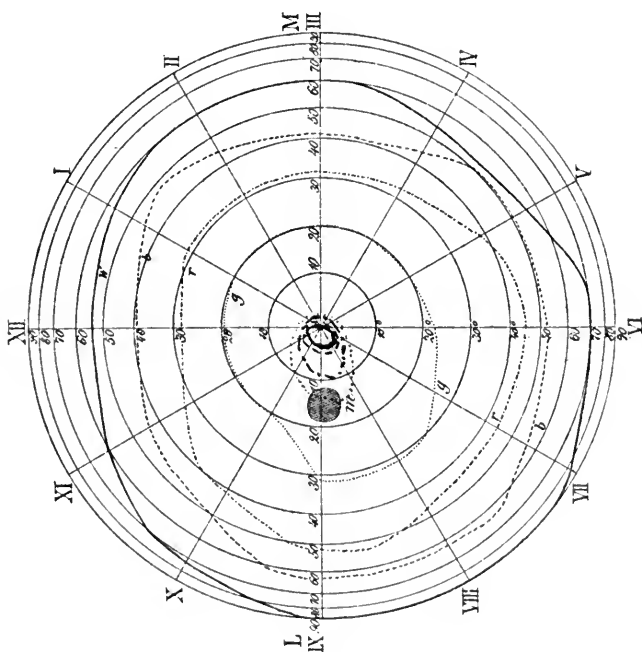
Among the first to recognize danger to sight from the continuous use of iodoform were J. Hirschberg,¹ of Berlin, who reports a case of amblyopia in a girl, occurring during the after-treatment of a hip-joint operation with iodoform,

¹ *Centralblatt für praktische Augenheilkunde*, Bd. vi., S. 922, 1882.

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and upon the iodoform being discontinued the amblyopia disappeared; and Priestley Smith,¹ of London, who reports a case in a young man suffering from tuberculous pleurisy, where in forty-one days as much as one thousand grains of iodoform were administered. Amblyopia occurring, the drug was discontinued. Associated with the loss of sight were headache, giddiness, diarrhœa, and constant taste and smell of iodoform. On the third day after the iodoform had been stopped there was great drowsiness and slight left ptosis, disappearing in twenty-four hours. The vision in both eyes was greatly impaired, and with the ophthalmoscope the margins of the discs were found slightly hazy, but there was no pronounced papillitis. Both eyes disclosed a well-marked central scotoma, absolute for white at or near the fixation point. Vision steadily improved under injections of strychnia until at the expiration of three months it was $\frac{6}{8}$, when no scotoma could be found. De Schweinitz² says of iodoform, up to the present time but four cases have been reported. In these, central scotoma, which at times was absolute, was present, and ophthalmoscopic changes, when found, limited to slight changes in the outline and color of the disc. The prognosis, he states, is good. Valude³ reports a case of burn of the right half of the body in a twelve-year-old child that was treated persistently with iodoform, where, in seven months, diarrhœa, headache, vomiting, and progressive blindness ensued. Upon discontinuing the iodoform all symptoms disappeared, and at the end of eighteen months there remained in both eyes white atrophy of the optic discs. In his opinion it is a question whether the amblyopia was due to the burn or the iodoform, since it has been found that neuro-retinal lesions at times follow extensive cutaneous burns. Terson⁴ also reports a case of burn of the thigh and lower abdomen in a woman forty-eight years old treated with iodoform, where in three weeks and without appreciable general symptoms of intoxication, progressive amblyopia set in. Both nerve-heads showed

¹ *Ophthalmic Review*, April, 1893.

² *Toxic Amblyopias*, 1896.

³ *Annales d'Oculistique*, 1893, vol. cix., p. 378.

⁴ *Archives d'ophtalmologie*, October, 1897.

whitish atrophy, especially the temporal sides, with vision $\frac{1}{8}$. The condition did not yield to treatment. In his opinion, however, it is likewise a question whether the amblyopia was due to the burns or to the iodoform; but from the history of their cases, both Valude and Terson incline to the belief that the iodoform was the toxic agent. It is generally conceded that lesions of the optic nerve and retina at times follow extensive cutaneous burns, and how this may be brought about is readily comprehensible after reading Lustgarten's paper in the *New York Medical Record*,¹ wherein he shows that after such burns an animal poison is generated by micro-organisms developed in the eschar. He believes this poison to be either muscarine or something very similar to it. It is highly virulent even in small quantities, five milligrammes causing in man symptoms of severe nervous irritation. Atropia, he states, negatives the effect of the muscarine by paralyzing the susceptibility of the nervous system. In my patient the character of the scotoma and the absence of severe constitutional symptoms, with the gradual restoration of vision after the withdrawal of the iodoform treatment, strengthen my belief that the iodoform was the toxic agent. His high susceptibility to medicinal action, as instanced by rapid ptyalism after attempted treatment by mercurial inunctions, may likewise be used as supportive of this conclusion. I do not expect further restoration of sight, since the trouble is of more than two years' standing and the nerve-head shows in the temporal half whitish discoloration, indicative of atrophy of the macular-fibre bundle.

¹ *New York Medical Record*, August 8, 1891.

HEMIOPIA FOLLOWING POISONING BY ILLUMINATING GAS, WITH REPORT OF A CASE.

BY HARRY FRIEDENWALD, M.D., BALTIMORE, MD.

(With a chart of the field of vision.)

DURING recent years many interesting observations have been made, showing the different effects of various systemic poisons on the organs of vision. To these I shall add one which is interesting and unique.

Mr. H., aged about forty-five years, inhaled illuminating gas on the night of September 26, 1899, from about eleven o'clock until he was removed at about four and carried to a hospital in an unconscious condition. Consciousness returned during the forenoon of the same day. Five days later he was admitted to the Baltimore City Hospital on account of an affection of the great toe, which was, however, unconnected with the poisoning. While here he was referred to me on account of visual disturbance. He stated that he had been unable to read since the poisoning. Finding central vision and the fundus of both eyes normal, I attributed the complaint to presbyopia and was not a little surprised to find that convex glasses did not help him. He was therefore examined at the perimeter, and the cause of visual disturbance was found in the hemiopia shown in the accompanying chart of the field of vision. Though an intelligent man he was not conscious of this defect. The line of separation lies in the vertical meridian throughout the upper half of the field and for colors in the lower half likewise. The line of separation does not pass directly through the point of fixation but is removed about one half degree to the left.¹

The motility of the eyes is perfect and there is no abnormality

¹ In order to test this point with accuracy I employed the Maddox scale which is used with his rod to measure deviations from muscular unbalance. The central spot is used as the point of fixation and the object used for testing may be one of the larger spots employed in perimetry, the distance four metres.

in the reaction of the pupils ; Wernicke's hemiopic sign is absent ; but the pupils differ slightly in size (R. 3 mm, L. 4 mm).

I wish to mention that he was able to read up to the time of the poisoning, that when he recovered consciousness his sight was somewhat disturbed, but that he was not blind. Furthermore, careful examination did not reveal any other symptoms of disease of the nervous system. The patient remained under observation for several months ; repeated examinations were made but no important change could be found in the field of vision as described above.

There is but one similar case in literature, that of Illing, published in the *Wien med. Zeit.* in 1874. The original is not accessible, but there is a review in *Nagel's Jahresbericht* (1874, p. 438), from which I take the following : An officer, poisoned by illuminating gas, recovered consciousness after violent vomiting. He was at first completely blind. On the following day vision returned ; there was right-sided hemiopia. The defects were not perfectly symmetrical. Illing ascribes the affection to a lesion, probably a hemorrhage, near the chiasm, and he attributes this to the violent vomiting.

Quite a mass of literature exists on the subject of diseases following the intoxication of illuminating gas, and many pathological observations have been made, some of these experimental, showing the lesions produced. Jaksch in his large work, *Die Vergiftungen*, mentions polyneuritis, chorea, poliomyelitis, multiple sclerosis, Landry's paralysis, softening of the brain, and idiocy as sequelæ. He states that ecchymoses are found in all organs and extensive hemorrhages as well as spots of softening in the brain.

One of the fullest accounts of the nervous sequelæ is found in an article by Becker in the *Deut. med. Wochenschrift*, 1889 (pp. 513, 540, 562).

After careful study of these articles we may assume that the lesion in our case was a hemorrhage or spot of softening in the brain. We should locate this in the visual cortical centre, for the following reasons : the incompleteness of the hemiopic defect, the absence of Wernicke's hemiopic pupillary reaction, and the absence of a positive scotoma in the defective half of the field, the patient being entirely unconscious of this defect. While none of these points are entirely conclusive, together they appear to warrant this diagnosis.

THE OCCURRENCE OF RETRACTION MOVEMENTS OF THE EYEBALL TOGETHER WITH CONGENITAL DEFECTS IN THE EXTERNAL OCULAR MUSCLES.¹

BY JULIUS WOLFF, M.D., NEW YORK,

Visiting Ophthalmologist to the Randall's Island Hospital ; Ophthalmic Surgeon of the Out-Patient Department, Mt. Sinai Hospital.

(*With three figures on text-plate II. and three figures in the text.*)

THE congenital defects in the external ocular muscles have been the subject of much study and numerous communications on the part of European and American writers within the last decade. Through the writings of Kunn, in particular, their nature has become more clearly understood, and their distinctive features recognized. There is, however, one peculiar and interesting clinical picture coming under this head that has hitherto attracted only the most limited attention, for reasons that will appear below. I refer to the *retraction movements* of the eyeball, of which but very few cases are recorded.

Though this designation is a rather cumbrous one, it is the best I can find to express that pathological condition in which, by the contraction of one or more of the external ocular muscles, the eyeball is drawn backward into the orbit, and returns to its former position when this contraction ceases.

Since my attention was first called to this condition by a publication of Tuerk (1) early in 1899, I have observed five cases of this kind, while only seven have hitherto been reported.

¹ Read before the Section on Ophthalmology and Otology of the N. Y. Academy of Medicine, Feb. 19, 1900.

The histories of my cases are as follows:

CASE 1.—Sarah W., age nineteen years. The mother of the patient relates that she has always been weak and puny, and of a very nervous disposition. Apart from the ordinary diseases of childhood she suffered from no serious illness. Menstruation began at the age of thirteen, since which time she has been afflicted with peculiar attacks that seem to be of an hysterical nature. She suddenly falls to the ground, makes one tonic contraction of her limbs, and then slowly rises. There is no loss of consciousness, no convulsion, nor other symptom of epilepsy. At present there is no organic disease, excepting that the patient is feeble and anæmic. She complains of frequent pains on the right side of the head. An abnormality in her eyes was noticed by the mother in early childhood, and has undergone no change.

Examination of the eyes reveals the following condition:

V. O. D. $\frac{2}{10}$, sph. + 1.0 D \subset cyl. + 1.25 D a. 50° nas. $\frac{4}{10}$.

V. O. S. $\frac{2}{10}$, E.

The external parts of both eyes appear normal and show no signs of past or present inflammation. The pupils are round and react well to light. When the patient looks straight ahead the right eye diverges about 20°, and the right palpebral fissure is only 7 mm wide, being 2 mm narrower than the left (text-plate II, Fig. 1). Furthermore there is a constant enophthalmus of the right eye of 2 mm. The movements of the left eye are normal in all directions, as are also the up and down movements of the right eye. Every attempt, however, to turn the right eye inwards is entirely unsuccessful and is accompanied by a most striking phenomenon, inasmuch as the eyeball is drawn back with a quick pull into the orbit fully 8 mm. Thereby it is withdrawn from contact with the lids, whose free borders, through lack of support, approach each other, so that the fissure becomes only 3 mm wide (text-plate Fig. 2). If this test is made while both eyes are open, the retraction of the right globe is also accompanied by an upward rotation. As soon as the attempt at inward rotation is given up, the eyeball and lids return to their original position. When the patient tries to turn the right eye outward from the primary position just the reverse occurs. The globe moves forward 2 mm and the fissure widens the same amount, so that it equals the left one, but not the least outward rotation is effected (text-plate Fig. 3).



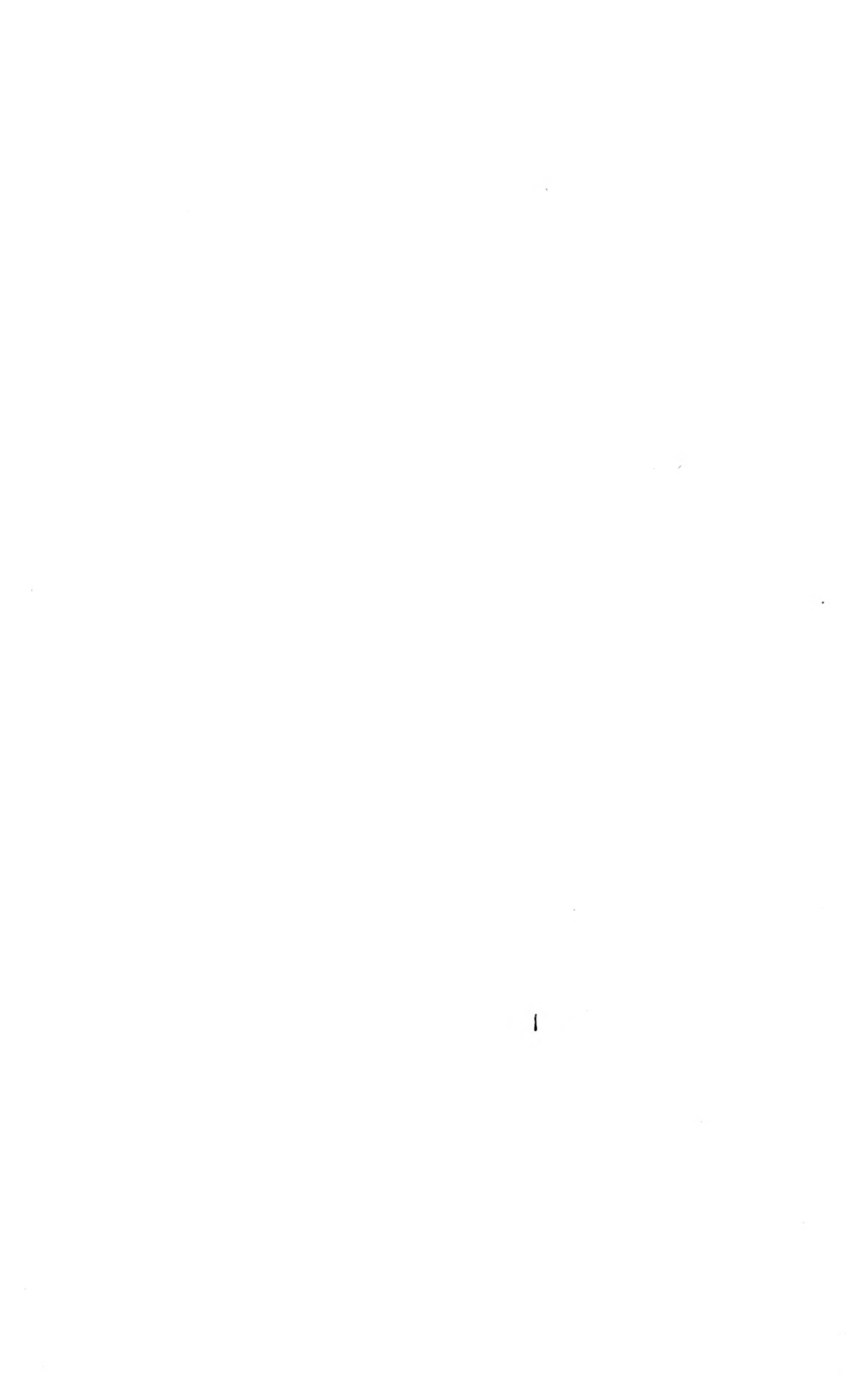
FIG. 1.



FIG. 2.



FIG. 3.



When an object of fixation is brought near to the patient to test convergence, the left eye follows it and turns inward, but the right one does not. Nor does it recede into the orbit as it would be expected to do if the internal rectus contracted, but, on the contrary, it moves forward. And vice versa, as the object is withdrawn and the patient looks into the distance, the right eye is retracted. This shows that there is no function of convergence present at all, and that the impulse which causes the left eye to fix upon near objects is not imparted to both internal recti, but is the same as that producing right lateral rotation.

After instilling cocaine into the right eye I tried with a pair of forceps to turn the same inwards, but was unable to do so to an appreciable extent. The globe seemed fixed on its outer side; I was, however, able to rotate it outwards.

Ordinarily the patient turns her head a little to the left. The axes of the eyes are then symmetrical and she has no diplopia. Stereoscopic and binocular single vision are present in this position. When the head is held straight there is still no diplopia, in spite of the divergence of the right eye, but with a Maddox rod before the latter crossed images can be produced.

CASE 2.—Ernst W., five and a half years of age, is the youngest of six children and the only one to present an abnormality of the eye muscles. When he looks straight ahead, the visual axes are parallel. The movements of the left eye are normal in every respect, and the right eye can be moved up and down to the normal limits. It cannot, however, be abducted beyond the middle line. Adduction is possible, though very much restricted, and is regularly accompanied by a retraction of the globe into the orbit to the extent of 3 to 4 *mm* and a moderate rotation downwards. At the same time there is slight narrowing of the palpebral fissure. Each attempt to move the right eye outwards beyond the middle line is marked by slight forward movement of the globe. Both eyes can converge upon an object brought as near as 12 *cm* from the bridge of the nose, and the right eye is retracted during the act of convergence just as it is during left lateral rotation. The vision of both eyes is approximately normal, but on account of the child's unreliable statements, cannot, any more than the presence of diplopia or binocular vision, be tested accurately. Though nothing wrong about the child's eyes was noticed by the parents till the age of two years, the condition above described is, without any doubt, congenital.

Cases 3, 4, and 5 are members of one family, two sisters and a brother.¹

The eldest of the three, Luise M., is a young lady of twenty. Vision of both eyes is normal. If left to herself she turns her head slightly to the right and the eyes are then symmetrically placed. If, however, the head is held straight the left eye diverges 15° to 20° , and there is crossed diplopia. All movements are executed perfectly with the right eye, and the left one moves normally upwards as well as downwards. It cannot, however, be rotated outwards more than 3 *mm* from the primary position, and this abduction is accompanied, as in the previous cases, by a forward movement of the globe and a slight widening of the palpebral fissure. Here also, inward rotation, which does not quite reach the normal limit, is accompanied by retraction of 3 *mm* and narrowing of the fissure by 2 *mm*. With the retraction a slight turning of the eye upwards takes place.

The fourth patient, Dora M., is a girl of fourteen and sister of the last one. Her head is usually turned to the right about 20° ; when it is held straight there is slight divergence of the left eye with crossed diplopia. The left eye cannot be abducted beyond the middle line, and inward rotation, which reaches only 3 *mm*, is marked by a quick retraction of one half of a centimeter, a pronounced upward rotation, and narrowing of the fissure from 12 to 6 *mm*. On the right side the same condition exists, but in a much less developed degree.

The last patient, Felix M., is a nine-year-old brother of Cases 3 and 4. He holds his head straight, and the eyes, in the primary position, are parallel. They can converge to a point 8 *cm* from the bridge of the nose. Vision is normal. The right eye shows normal motility. The left one can be abducted with difficulty about 4 *mm*. Adduction is only slightly restricted and is accompanied by a moderate retraction, but no perceptible narrowing of the fissure. The forward movement of the eyeball, as the eye recovers from the adducted position, is more readily noticed than the retraction during adduction. This is the least pronounced case of all. Binocular single vision is present in all

¹ These cases are the same as those described by Carl Kunn, of Vienna, in a monograph on congenital defects of ocular movements (*Beitr. z. Augenheilk.*, Heft xix., pp. 59-65). Kunn seems to have overlooked the retraction of the eyeball, as he does not mention it. In every other respect his descriptions of these cases are most accurate and apply exactly to the present condition. I shall, therefore, describe only those features which have a direct bearing upon the subject of this paper, and refer to Kunn's description for other details.

parts of the field in which the axes of both eyes can be made to cross at the object of fixation ; otherwise there is diplopia.

When I compared the above cases and the cases of retraction movements previously reported, of which there are only seven, I found that with the exception of the one published by Heuck (2) in 1879, they all presented a most striking similarity in their general features. Of the six other cases one was published by Stilling (3), three by Tuerk (1, 4), one by MacLehose (5), who states that he has seen others just like it, and one by Bahr (6).

The first point that all these cases (including my own) have in common, is the association of the retraction movements with a congenital defect in the motility of the retracted eye. Heuck's case, which differs somewhat from the rest, presented bilateral ptosis and almost complete immobility of the right eye. Every attempt to move the eye resulted merely in a slight retraction of the globe into the orbit. In all of the other cases, however, only the external rectus of the retracted eye showed a more or less complete impairment of its function. [I have, hitherto, purposely refrained from calling this congenital muscular defect a paralysis, for, strictly speaking, it is not such. Sillex has shown the pathological condition underlying it to be a lack of development, an aplasia, and not, as in acquired paralysis, an atrophy or degeneration. When, therefore, I shall hereafter apply the name paralysis to these congenital defects, I shall do so for the sake of conciseness, and with this limitation in mind.]

The second point of resemblance between all of these cases, that of Heuck being for the present disregarded, is that the retraction invariably takes place during attempted inward rotation—that is, when the antagonist of the paralyzed muscle is innervated. The inward rotation itself is in some cases entirely absent, in others only impaired, thereby simulating to a greater or less degree a paralysis of the internal rectus muscle. The explanation hereof will appear later.

The next common symptom, namely, the narrowing of the palpebral fissure during adduction, is directly due to the

retraction of the globe, and is the more pronounced the greater the retraction. It is not to be construed, as has erroneously been done, as an active contraction of the orbicularis, but is due to the loss of the support given to the lids by the eyeball, just as in cases of enophthalmus and shrunken globe.

There is a further symptom which has not been described in any of the previously reported cases, probably because of having been overlooked, but which is present in four of my five cases. I refer to the forward movement of the globe, accompanied by widening of the palpebral fissure during attempts to turn the eye outward from the primary position of looking straight ahead. This symptom is just the converse of the preceding one.

Several of the cases, especially those in which the affected eye diverged while the head was held straight, presented a condition of permanent enophthalmus and narrowing of the fissure, not only during adduction, but also while the gaze was directed forward.

Finally, in nearly all of the cases in which the retraction was considerable, the latter was accompanied by an upward or downward deviation of the eyeball, even when pure adduction was attempted.

As the symptom of retraction by muscular action has not been described in any other than the above twelve cases, it will be seen that it never occurs alone, but is always combined with certain other symptoms, forming a well-defined clinical picture, which presents differences in degree of development only, and not differences in kind. Heuck's case is only in so far different from all the others in that not only the external rectus, but all of the muscles, except the retracting one, were paralyzed.

The chief interest connected with this clinical picture lies in its explanation. Tuerk, of Berlin, who published two of the cases in 1896 (4), and another early in 1899 (1), suggested what seems to me undoubtedly to be the correct interpretation. He mentioned two possible ways in which retraction of the eyeball might be produced, which I shall briefly designate as the *faulty-insertion* and the *fixation* theories.

According to the *faulty-insertion theory* the retracting muscle, which is the internal rectus, is attached to the eyeball farther back than normal. Consequently, the portion of muscle capable of unwinding itself from the globe is diminished, and inward rotation is correspondingly replaced by a backward pull on the globe when the internal rectus contracts. This theory finds support in the cases of Heuck and Bahr. The former incised the conjunctiva and found the insertions of the external and superior recti situated considerably farther back than normal. The other muscles were not inspected. Bahr operated upon his case to cure the convergent strabismus of the retracted eye. He found no trace of the presence of an external rectus, while the internal rectus consisted of two portions, the one inserted 12 millimetres from the cornea and the other still farther back. But even if, in these two cases, a faulty insertion of the internal rectus could have caused the retraction, the theory does not take into account the paralysis of the antagonist which is present in all the cases and ought, therefore, to be considered as a factor in explaining the mechanism of retraction.

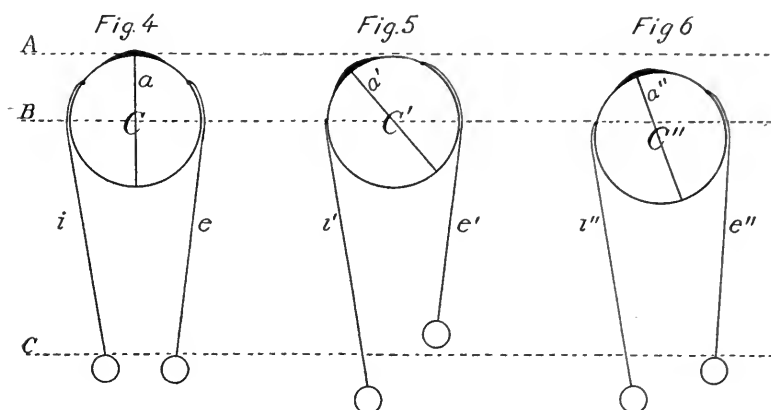
The *fixation theory* seems to me to be more in accord with the clinical manifestations of most of the cases of retraction movements. In advancing this theory, Tuerk assumes that the paralyzed external rectus consists of an unyielding connective-tissue strand in place of elastic muscle fibres. It, therefore, fixes the eyeball on its outer side and offers an obstacle to adduction, so that the eye can yield to the traction of the internal rectus only by moving back into the orbit at the same time that it turns inward. This action is well illustrated by a model which has been constructed for me very ingeniously by Dr. Sidney Yankauer, and which is represented by Figs. 4, 5, and 6.

Since the muscles in question are direct antagonists and lie in the same plane, the eyeball is represented in the model by a circular piece of card-board which can revolve about the centre of rotation (c, c', c''). The internal and external recti muscles are represented by silk threads (i, i', i'' and e, e', e''), at the proximal ends of which small rings are

attached, allowing traction to be easily made. The base-line C is at the points of insertion of the muscles at the optic foramen, and the shortening and lengthening of the elastic muscles, during contraction and relaxation respectively, is indicated by the distance that the ring moves behind or in front of the base-line C.

Fig. 4 represents the normal eye in the primary position.

Fig. 5 represents normal adduction of 45° . The centre of rotation, c' , remains stationary, and just as the internal rectus, i' , is unwound from the globe, the external rectus, e' , is rolled up around it.



If, however, the external rectus, e , is inelastic and unyielding, as the fixation theory assumes it to be, and as it is made to be in the model by fastening its ring at the base-line C, then it is clear that contraction of the internal rectus, i , not only results in adduction, but also displaces the eyeball backwards in toto, as represented by Fig. 6. Though the amount of contraction of the internal rectus be the same in the conditions represented by Figs. 5 and 6, the resulting adduction is much less in the latter case than in the former. This would explain why, in all the cases of retraction, adduction is incomplete, even though the internal rectus be normal in its insertion and power.

There is abundant evidence that this fixation theory is correct. In the first place it has the attribute of plausibility, because it accounts in an unstrained manner for all the

symptoms, the defective abduction, as well as the diminished adduction and the retraction. The more inelastic the external rectus is, the more pronounced will be the other symptoms. Furthermore, Tuerk has found, experimentally, that when the eyeball is firmly fixed on one side with a pair of forceps and the opposite muscle is strongly contracted, a retraction of the eyeball invariably results. The inelasticity of the paralyzed external rectus has been proved in several cases, including my first one, by the fact that even strong traction with the forceps could not produce pure adduction. Nor is the direct evidence of inspection wanting. Stilling operated upon his case in order to cure the divergent strabismus that was present. He advanced the internal rectus, which was not found to have a faulty insertion. The result was that the retraction became even more pronounced than before. I also operated upon my third case in order, if possible, to cure the retraction, for a reason I will mention later. I found both the external and internal recti normally inserted, and divided the former in the hope that it would reattach itself farther back. The immediate result of the operation was that the slight abduction, which had been present, was lost, adduction increased, and the retraction no longer to be seen. After the muscle had reattached itself, however, the condition was just the same as before. Since in these two cases a normally inserted internal rectus caused retraction of the globe, there must have been some fixation on the outer side by the external rectus.

The constant enophthalmus which has been observed in several of the cases even when the patient looks straight forward, is also readily explained by the same mechanism. We need only bear in mind that, normally, in the primary position of the eyes, the internal recti (as well as all the other muscles) are in a state of slight contraction, and are only relaxed completely when their antagonists contract — that is, during outward rotation. This tonus of the internal rectus suffices, when the unyielding external rectus is rather short, to hold the eye in a retracted position, and then we get the condition presented in Fig. 1. The complete relaxation of the internal rectus also explains the propulsion of the globe

during attempted abduction from the primary position, to which I have drawn attention above.

One further peculiarity of these retraction cases remains to be explained. Whenever, in the more pronounced cases, the normal eye was abducted, the affected eye not only turned more or less inwards and receded into the orbit, but also made either an upward or a downward movement. I would explain this phenomenon as follows: As the eyeball recedes into the orbit it displaces the orbital contents, but the optic nerve, having a firm consistency, offers a certain amount of resistance to the backward movement of the eyeball at its point of attachment. Unless this resistance is made just in the plane of the retraction, the effect must be to rotate the cornea either upwards or downwards; upwards, if the point of resistance lies below the plane of retraction, downwards if it lies above. Which of the two conditions is present in any individual case will depend upon its anatomical peculiarities.

Thus far these cases of retraction of the eyeball might seem to be objects of scientific interest only, but in reality they sometimes also present questions of practical importance. For example, my first and third cases have always complained of headaches on the same side as the affected eye. That these headaches are due to the oft-repeated retraction of the globe and consequent pressure on the orbital contents, I feel quite certain. If any one will repeatedly push back his eye into the orbit for a half or three-quarters of a centimetre, he will experience an unpleasant sensation of pain. Indeed, these two patients always complained of increased headaches whenever their ocular movements were tested at length. I, therefore, advised both of them to submit to an operation in the hope that the retraction of the globe might be cured. The first patient did not consent, the other has had an operation performed. As I mentioned above, I divided the external rectus and, for the time being, both the retraction and the headaches were relieved. But both returned, because the muscle, not possessing much contractility, undoubtedly reattached itself at its old point of insertion. If I had kept the eye fixed in an adducted posi-

tion during the process of healing and thus succeeded in setting back the external rectus — that is, practically lengthening it, I believe the retraction and probably also the divergence would have been cured. A glance at Figs. 5 and 6 will show, provided the fixation theory is correct, that this is the only rational proceeding in those cases which present divergence in the primary position. Advancement of the internal rectus would only aggravate the condition, as shown by Stilling's case. Some of the cases, however, present convergence of the retracted eye in the primary position. The proper proceeding, provided an operation is indicated at all, would then be a tenotomy of the retracting internal rectus with fixation of the globe in an abducted position to ensure an effect. It seems to me that in this way the convergence and retraction would be improved, though some motility would be sacrificed.

In concluding I should like to express the opinion that these cases of retraction movements are not so very rare as it would seem, and that they are undoubtedly frequently overlooked. The cause for this may well lie in the fact that the narrowing of the palpebral fissure hides the backward movement of the globe. Clear examples of such an oversight are given by the two sisters and one brother, my third, fourth and fifth cases. As was mentioned above, Carl Kunn (7), Vienna, who certainly is a most careful observer, failed to see the retraction, though he published these same cases as examples of congenital paralysis. Farther along in the same article Kunn (8) relates another case which resembles in every way the typical picture I have described, except that the retraction is not mentioned; and here, too, I am inclined to believe that it was overlooked. The same may be said of a case of Alfred Graefe (9), described in his *Handbook*, in which there was complete congenital paralysis of the left external rectus and a striking narrowing of the fissure during adduction of that eye.

It is fair to assume, then, that many of these cases have been overlooked, and that when attention is generally drawn to them, they will be found to be of more frequent occurrence than the few cases hitherto reported would indicate.

SUMMARY.

Retraction movements in the human eye have been described in only seven cases, to which five are herewith added.

The retraction movements never occur as a solitary symptom, but always form part of the same group of clinical symptoms, producing a well defined clinical picture, whose characteristics are as follows :

The condition is always congenital.

Retraction occurs during attempted adduction, which may be absent or present, but is always less than normal.

Retraction is accompanied by narrowing of the palpebral fissure.

Partial or complete paralysis of the external rectus of the retracted eye is regularly present.

Some cases present a moderate constant retraction and narrowing of the fissure even in the primary position. In these cases attempts at abduction produce a propulsion of the globe and widening of the fissure.

When the retraction is considerable, the cornea is turned upwards in some cases, downwards in others, even when the fellow eye makes a purely lateral movement. This is due, probably, to resistance made by the optic nerve.

Two explanations are offered to account for the retraction : the *faulty-insertion* and the *fixation theories*. Though the former is supported by some evidence, the latter accounts more satisfactorily for all the symptoms and is even better supported by evidence.

Surgical interference may benefit some of the cases.

There is reason to believe that the retraction movements are often overlooked and that these cases are not so rare as the small number reported would indicate.

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REPORT OF A CASE OF RETRACTION OF THE EYEBALL.

BY DR. A. N. ALLING, NEW HAVEN, CONN.

(With two figures on text-plate III.)

MY attention was first called by Dr. Wolff to the class of cases which forms the subject of the preceding article. On June 21, 1899, the following case came under my observation :

Ruth H., seven years. Only child. Healthy. No instruments used at delivery. Left eye does not turn outward beyond the median line. It turns inward only 25° and at the same time *is drawn directly backward* into the orbit about 10 mm. The palpebral fissure simultaneously narrows to about one half its width in the other eye. (vd. plate). Motility upward and downward is normal. The child habitually carries the head to the left side. Vision, with correction for slight astigmatism, normal in both eyes. Motility of right eye is perfect.

Thinking to do away with the disfiguring retraction of the eyeball, a tenotomy of the left internal rectus was made. The tendon was found to be very broad and thick, but its insertion was normal. An exploratory incision over the external rectus revealed nothing but tendinous tissue, giving the impression of conditions in the cadaver. There was a sense of resistance on forcible rotation toward the caruncle. This, however, could be accomplished.

There was diplopia for a few days after the operation. The final result (eight months) shows motility much diminished inwards and a slight amount of retraction. The eye can be turned outward a very little beyond the median line and the head is no longer held to one side. There is no divergence. In spite of the decreased motility the cosmetic result is satisfactory.



RETRACTION MOVEMENTS IN A CASE OF CONGENITAL CONTRACTION OF THE INTER- NAL AND PARALYSIS OF THE EXTERNAL RECTUS OF THE LEFT EYE.

BY HERMAN KNAPP, NEW YORK.

THE preceding paper of Dr. Julius Wolff, and the communication of another case by Dr. A. N. Alling, of New Haven, Ct., determines me to add the subjoined case from my practice to the scanty records of this rare muscular anomaly described with so much detail and suggestiveness by Dr. Wolff.

Jan. 18, 1896, Mr. Elk. Deiches, then of Johnsonburg, Pa., brought to me his five-year-old daughter, Edith. Her left eye showed a congenital convergence of about $3'''$, $S = \frac{2}{20}$, interior normal. With the ophthalmoscope, under homatropia, I found that her right eye had H 3. D, the left eye H 6. D. After birth the left eye was stiff, but gradually acquired a certain degree of mobility. It was deep-seated. I prescribed for both eyes +3.D which she has worn since.

Those are the notes in my case-book.

She was not seen until March 31, 1900, living now in 57 E. 117th St. of New York City. The girl was somewhat frail, but healthy and intelligent. The left eye was in adduction of 20° , and somewhat sunken in. By voluntary movements to the right side the adduction was increased by about the same degree, while the eye at the same time was conspicuously drawn back and somewhat down. The palpebral fissure was narrowed and the eyeball receded so as to lose touch with the lids. In the most forcible abduction the globe was directed straight forward, with greatest effort slightly beyond the median plane. In these movements the eyeball not

only resumed the normal position, but even showed a slight protrusion. In ordinary look it was slightly retracted and about 4 mm deflected toward the nose. With +1.25 S R is $\frac{2}{2}^{\circ}$, L $\frac{2}{4}^{\circ}$. No diplopia.

May 7, 1900, I made a tenotomy of the left internal rectus. The tendon was very thick and its insertion line reached downward almost to the insertion of the inferior rectus. As the effect after the severing of the insertion of the tendon was insufficient, I divided subconjunctivally, on the hook, some bands which seemed to be posterior insertions. Immediately the eyeball protruded and diverged markedly, moving neither in- nor outward, while the vertical movements were preserved, but restricted. I stitched the tendon forward with three firm sutures, the effect of which was reduction of the protrusion of the globe. The latter retained a slight divergence, and both adduction and abduction were completely suspended, whereas the vertical movements were fair. I did not care further to change the position of the eyeball, *i. e.*, produce a small degree of convergence, as the conditions I had to deal with were novel. I thought I would wait and do a correction of the position, if needed, later. To-day, May 25, 1900, the child came again ; positions and mobility are greatly improved. The eyeball does not protrude any more, and there is so small a divergence that the cosmetic effect is, to all parties, quite satisfactory. Abduction is almost nil, adduction restored to a certain degree, with the accompanying retraction. The patient sees double sometimes ; she evidently has now binocular vision, as she turns her head slightly to the left and holds her eyes parallel.

This is certainly a case of the same kind as those of Wolff and others. I abstain from attempts at an explanation of the singular phenomenon, which made on me the impression of the voluntary retraction of the eyes in certain animals, for instance the horse. The operation also demonstrated something like a retractor muscle.

A CASE OF A GLAUCOMATOUS ATTACK FOLLOWING INSTILLATION OF EUPHTHALMIN.

By HERMAN KNAPP.

IN my "Note on the Use of Euphthalmin" in the May number of the ARCHIVES OF OPHTHALMOLOGY vol. xxvii., p. 313, 1899, I said (p. 314): "In two cases I received the impression that euphthalmin, like atropin, had a tendency to increase the eyeball tension. In many later cases I have not seen this effect any more." In the subjoined case, two drops of a $7\frac{1}{2}$ per cent. solution of Schering and Glatz's hydrochlorate of euphthalmin brought about such a pronounced and immediate onset of an acute attack of glaucoma as I have ever seen after the instillation of any other mydriatic. The case is as follows:

Mrs. A. P. Leach, of 123 W. 80th Street, New York City, aged sixty-two, consulted me April 22, 1900. Her left eye was blind from absolute glaucoma; in the right $S = \frac{2}{4}^0$ with $+1^{\circ}$ ax. horiz. $\frac{2}{2}^0$; pupil, field of vision, and tension normal. Noticed diminution of sight recently in R and pain in L eye. Several times she has seen green and blue rings around lights, with dimness of sight and ciliary neuralgia. When she presented herself, I found the anterior chamber of the right eye shallow, especially above. To examine the background, I dropped two minims of a 7.5 per cent. solution of euphthalmin into each eye. In ten minutes I noticed $+T\frac{1}{2}$ in the right, and $+T_1$ in the left (blind) eye. During the next fifteen minutes, the tension increased in both eyes; in the right it was $+T_1$ fully, cornea steamy, eye painful, sight markedly dim, pupil dilated ad maximum, optic disc distinctly but not completely cupped, and marked haloes were seen around the light,—in short, there was a pronounced outbreak of acute glaucoma. I instilled two drops of a 2 per cent. solution of pilocarpin, and in half an hour two drops more. Half an hour later, the pupil was

medium wide, but the cornea still hazy, S dim, haloes persistent, and still $+T_1$. I told the patient the attack was produced by the first eye-water, which was generally believed harmless, and as the other drops had relieved but not cured the attack, I would instil a stronger antidote. She was not at all frightened, I dropped two drops of a 1 per cent. solution of sulphate of eserine in both eyes, which in from fifteen to thirty minutes had, in the right eye, reduced the tension to the normal, restored sight, dispelled the colored rings, contracted the pupil to about 1 mm in diameter, — in short, had caused the glaucomatous attack to disappear completely. The left (blind) eye was also relieved. A few days later I performed a glaucoma iridectomy on the right eye which healed smoothly. Sight, tension, etc., have since been normal.

Though I anticipated such cases from the beginning of my acquaintance with euphthalmin, I have used the remedy daily, and the remarkable freedom from a hypertonic action of the drug emboldened me to use it indiscriminately also in examining glaucomatous eyes. Here and there it was followed by a doubtful increase of tension, which always disappeared, even without a miotic, except in the above case, where the milder miotic, pilocarpin, was not sufficient to cut the attack short. Euphthalmin is such a useful auxiliary in ophthalmoscopy that I shall not hesitate to use it everywhere as heretofore, for it produces glaucomatous attacks only exceptionally, attacks which, it seems, can readily be cured with eserine.

Euphthalmin has hitherto enjoyed an excellent reputation of being free from the unpleasant secondary effects of the other mydriatics. The above case demonstrates that it may, like all the rest, produce glaucoma. Is it not permissible to suppose that euphthalmin, having only a weak and transient action on accommodation, is likely to possess, only in a less degree all the other favorable and unfavorable properties of atropine, the chief representative of the mydriatic group? Formerly we were taught to substitute extract of belladonna ($\frac{3}{4}$ i ad $\frac{5}{8}$ i) for atropine when the latter produced erythema, conjunctival irritation as in trachoma, and the like. The question is: Are all the mydriatics poisonous proportionately to their strength, or are there any that are free from secondary effects inherent in the stronger ones?

SYSTEMATIC REPORT ON THE PROGRESS OF
OPHTHALMOLOGY IN THE FOURTH
QUARTER OF THE YEAR 1899.

BY DR. ST. BERNHEIMER, IN VIENNA ; DR. O. BRECHT,
PROF. R. GREEFF, PROF. C. HORSTMANN, AND DR.
R. SCHWEIGGER, IN BERLIN ;

WITH THE ASSISTANCE OF

DR. G. ABELSDORFF, Berlin ; Prof. E. BERGER, Paris ; Dr. SWAN M. BURNETT,
Washington ; Dr. DALÉN, Stockholm ; Dr. J. HERRNHEISER, Prague ;
Prof. HIRSCHMANN, Charcow ; Dr. KRAHNSTÖVER, Rome ;
Dr. P. VON MITTELSTÄDT, Metz ; Prof. DA GAMA
PINTO, Lisbon ; Dr. C. H. A. WESTHOFF,
Amsterdam ; and others.

Translated by Dr. WARD A. HOLDEN.

Sections I.-III. Reviewed by PROF. HORSTMANN.

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ANDREÆ (517) is under the impression that the views generally held as to the nature and results of lime injuries are erroneous. The injury depends upon the chemical or physical action of the lime on the tissues of the eye. Only the insoluble calcium combinations are non-injurious. All the other salts have an identical action, consisting in a destruction and loosening of the tissues, in the deposition of a white mass in the cornea and conjunctiva, and in a secondary inflammation, with, finally, the formation of a scar. In fresh cases of injury, long-continued washing out of the eye with pure water is the best method of treatment. Acids should not be employed.

SCHULEK'S (518) work contains papers by himself on glaucoma, instruments for cataract extraction, and protecting glasses; by Imre, on cataract operations and argentamin; by Csapodi, on examinations of large numbers of persons and on adaptation of the retina; by Issekutz, on retrobulbar echinococcus; by Grosz, on the eye symptoms of tabes; by Blascovics, on tumors of the cornea, and prolapse of the contents of the ball after intraocular hemorrhage; by Scholtz, on leucæmic retinitis, anterior sphincterolysis, and new formation of membranes in retina and vitreous; by Waldmann, on glaucoma, and the operation for luxated cataract; by Leitner, on hereditary optic-nerve atrophy and retrobulbar neuritis; by Mark, on atropine conjunctivitis; by Abel, on the presence of bacilli in cases of mental disease; by Hauer, on atropine conjunctivitis; and by Schwitzer, on the etiology of senile cataract.

WIDMARK'S (519) reports contain papers by Dalén, on holo-cain; by Helleborg, on tumor of the iris; and by Widmark, on blindness in Scandinavian countries and in Finland.

Widmark's statistical investigations rest partly upon official statistics and partly on the examination of patients in hospital and private practice. The following are the facts of particular interest : The percentage of blind persons to ten thousand inhabitants is in Denmark 5.3, in Sweden 8.3, in Norway 12.8, and in Finland 15.5 ; trachoma being more frequent in Finland, and 30 per cent. of the blindness in that country having been produced by trachoma. Trachoma has long been recognized in the northern countries, and in the literature of the eighteenth century was reported as being endemic in certain regions.

In Norway the high percentage of blindness is chiefly due to diseases of old age ; 50 per cent. of all cases are attributed to cataract, the extensive and sparsely populated land rendering operative treatment difficult.

In Sweden traumatic causes play an important rôle, direct injuries furnishing 9 per cent. and sympathetic ophthalmia 10 per cent.

In general, ophthalmia neonatorum is responsible for between 20 and 30 per cent.

Blindness in these lands has decreased very greatly in the last decades. DALÉN.

SALZMANN (520) has prepared two charts of sections of the human eye. The first represents a horizontal section through the eye ; the second the angle of the iris and neighboring parts.

MELLINGER (526) treated 2883 patients and performed 225 operations, 79 of which were for cataract. He reports further a number of rare cases.

MACHEK (527) reports on the work done in the eye department of the Lemberg (Galicia) hospital between 1892 and 1898 ; 8915 patients received hospital treatment, and 11,892 were treated as out-patients. Glaucoma and lachrymal diseases were found twice as frequently in women as in men. Twenty-eight per cent. of all the patients had trachoma ; 1023 extractions were done, and 1358 iridectomies.

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536. HEINE. Autoöphthalmoscopy in the inverted image. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 332.

537. MOHILLA. Reports on the open treatment of wounds after eye operations. *Ibid.*, p. 353.

According to BIETTI'S (529) investigations, after optico-ciliary neurectomy there may be an extensive new-formation of nerve twigs from the central stump, which in spite of lack of coaptation penetrate the sclera through new as well as the old channels and provide even an excessive supply of nerves to the inner portions of the eye, particularly the ciliary body. Furthermore, a retro-bulbar cicatrix-neuroma may be found whose numerous irregular fibres do not enter the sclera. A vicarious innervation on the part of the ciliary nerves could not be discovered.

In a case of chronic glaucoma in both eyes in which iridectomy and the use of eserine had been of no avail, ZIMMERMANN (530) extirpated the superior cervical ganglion. Immediately the pupil on the operated side contracted and the intraocular tension became diminished. The condition was permanent.

According to HOFFMANN (531) the Koch-Weeks bacillus causes an acute, and not rarely croupous, very contagious inflammation of the human conjunctiva. This acute inflammation may become chronic and lead to considerable papillary hypertrophy of the conjunctiva. In these folds the Koch-Weeks bacilli may long be retained, so that the communication of the disease is easy.

OERTZEN (532) found the pneumococcus in 4 per cent. of normal conjunctivas. It is therefore necessary in all operations

to wash out the conjunctiva with a mild antiseptic solution such as hydrarg. oxycyan. 1:3000.

HELBROU (534) gave to six rabbits a naphthalin-paraffin mixture 1:8. The first result was a marked hyperæmia of the choroid, ciliary body, and retina, and a less marked hyperæmia of the iris. Following these there appeared a serous or fibrino-serous exudation between the choroid and retina, on the retina, and in the vitreous. Later there was emigration of leucocytes. Finally cataract formed, but this was not due to the inflammatory processes.

NEUSCHÜLER (535), experimenting on rabbits and cats, has observed constantly an increase in the tension of the eye in narcosis.

MOHILLA (537) has practised the open treatment of the wound in 195 operations. According to his view the new system has not such advantages that the old is to be given up entirely, but as regards the patient there are many points in its favor.

III.—INSTRUMENTS AND REMEDIES.

538. DALÉN. On holocain and its action on the corneal epithelium and on the healing of corneal wounds. *Mitth. a. d. Augenk. d. Carol. Med.-Chir. Instituts zu Stockholm*, ii., p. 1.

539. WEBER. The action of protargal in a case of blennorrhœa in an adult. *Wochenschr. f. Ther. u. Hyg. d. Auges*, ii., No. 42.

540. PERGENS. On argentamin. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 313.

541. LANGLE. A new apparatus for measuring regular astigmatism. *Ibid.*, p. 360.

DALÉN (538) states that holocain $\frac{1}{2}$ –1 per cent. dropped into the conjunctival sac produces in $\frac{1}{2}$ –1 $\frac{1}{2}$ minutes complete anæsthesia of the cornea and conjunctiva, which lasts fifteen minutes. The drug has no effect upon the pupil, the accommodation, or the intraocular tension, nor does it produce anæmia. One objection to the use of the drug is its toxic effect, which is five times as great as that of cocaine. Furthermore, it more readily causes opacity of the cornea and loosening of the epithelium. No disturbing influence on the healing of corneal wounds had been observed.

According to PERGENS (540) there are two sorts of argentamin on the market which are to be distinguished as phosphor-argentamin and nitrargentamin.

Sections IV.-VII. Reviewed by DR. BERNHEIMER, Vienna.

IV.—ANATOMY.

542. BERNHEIMER. The purely anatomical proof of the existence of uncrossed optic-nerve fibres in man. *Arch. f. Augenheilk.*, xl, 2, p. 155.

543. KÖLLIKER. New observations on the anatomy of the optic chiasm. *Festschr. d. phys.-med. Gesellschaft, Würzburg*, 1899.

544. BALLOWITZ. On the corneal cells of man and the vertebrate animals. *Graefe's Archiv*, xlix., 1, p. 8.

545. KOSTER. Studies on the elasticity of the sclera. *Ibid.*, 2, p. 448.

BERNHEIMER (542) found the formation of medullary substance in the brain and visual tracts of an infant of ten days delayed and irregular. In numerous sections of the upper half of the chiasm only the uncrossed fibres had their medullary sheaths. Stained by Weigert's method, these fibres appeared isolated. It was therefore possible in perhaps twenty sections to trace single nerve fibres from one optic nerve into the tract of the same side. This was the first purely anatomical proof of the presence of uncrossed fibres in man, and this definitely ends the controversy in regard to their existence.

KÖLLIKER'S (543) latest researches with the Golgi method on the sheep, cat, cow, dog, pig, and rabbit prove definitely that there are uncrossed fibres in the chiasm. In human preparations in which the Weigert medullary stain was used, Kölliker was unable to find any great number of uncrossed fibres, but he did not regard his observations as conclusive.

BALLOWITZ (544) had made interesting experiments on the corneal cells in man and other vertebrates. He used most frequently sublimate or glacial acetic acid and sublimate hardening solutions,—those of Herrmann and Flemming. In all the corneal cells there is present a microcentre composed of two central bodies. The form of the nucleus and the form and size of the central bodies and microcentre vary greatly. The two appended

plates explain the details of these variations. It is probable that the differences thus revealed between the corneal cells and the leucocytes may prove to be of practical value in the study of inflammatory processes in the cornea.

V.—PHYSIOLOGY.

546. SACHS and WLASSAK. The optical localization of the median plane. *Zeitschr. f. Psych. u. Physiol. d. Sinnesorgane*, xx., 1, p. 23.

547. GOLOWIN. Investigations on the specific gravity of the aqueous humor. *Graefe's Archiv*, xlix., 1, p. 27.

548. SALZMANN. Vision in diffusion circles and the apparent accommodation of the aphakic eye in particular. *Ibid.*, p. 168.

549. VERWOOST. The reaction of the pupil in accommodation and convergence and following the illumination of areas of the retina of varying size with a constant amount of light. *Ibid.*, xlix., 2, p. 348.

550. HERTEL. On the results of the extirpation of the superior cervical ganglion in young animals. *Ibid.*, 2, p. 430.

551. HANSELL. Physiologic variations in the size of Mariotte's blind spot. *Am. Journ. of Ophth.*, Nov., 1899.

SACHS and WLASSAK (546) have studied the question of the conditions under which an object appears directly in front, rather than to the right or left. It was found that the localization of the middle did not depend upon the muscle-sense or the perception of motion.

GOLOWIN (547) made detailed investigations on the specific gravity of the aqueous humor of various living animals, using the pycnometer made by the Alvergmatt firm in Paris.

The specific gravity in the normal eye was fairly constant,—for the dog, rabbit, and cat 1.008 or 1.009. The aqueous humor that collects immediately after evacuation is of greater specific gravity, resembling in this respect serous transudations. The osmosis of 5% salt solution from the conjunctival sac scarcely changes its specific gravity, although after removal of the corneal epithelium the specific gravity becomes higher. Subconjunctival injections of 5% salt solution do not change the aqueous. Immediately after death the specific gravity falls somewhat. In acute inflammatory glaucoma it is considerably increased.

In his studies of the pupillary reaction VERWOOST (549) has found that the reaction occurring as distant and near objects are fixed alternately, is associated with convergence and not with accommodation. Other experimenters had erred in the matter for the reason that an alteration in convergence had not been wholly excluded. The light reaction depends upon the total quantity of light which enters the eye, no matter how large or small a portion of the retina it may be distributed over.

HERTEL (550) removed the superior cervical ganglion from young animals in order to study the influence of the lesion upon the growth of the eye and the condition of the intraocular tension; 31 rabbits were operated on at an age of 10-20 days. The well-known transitory ocular signs of section of the sympathetic were observed, but it was found that the lesion of the sympathetic did not affect the development of the rabbit's eye. An hour after the operation the eye of the operated side showed a marked hypotony. This soon disappeared, and in five days at the longest the tension became equal in the two eyes.

HANSELL (551) has examined the "blind spot" in 37 pairs of emmetropic eyes, 11 pairs of hyperopic eyes, and 4 pairs of myopic eyes in intelligent persons, and finds that in the emmetropic eyes the average distance from the point of fixation was 8 *cm* when the examination distance was 33 *cm*. The average distance for H. was about the same, while in M. it was fully 5 *mm* greater. The middle of the blind spot was below the point of fixation. In H. and Em. it averaged 10 *mm*; it was 1 *mm* less in M. In M. the long diameter of the oval was 38 *mm*, in H. 34 *mm*, in E. 31 *mm*.

VI.—REFRACTION AND ACCOMMODATION.

552. HEINE. Further contributions to the anatomy of the myopic eye. *Arch. f. Augenheilk.*, xl., 2, p. 160.

553. HESS. Studies on accommodation, v. *Ibid.*, p. 241.

554. VON HIPPEL, A. The permanent results of the operation for myopia. *Ibid.*, p. 387.

555. GERHARDT. Report on 52 operations for myopia. *Inaug. Dissert.*, Giessen, 1899.

556. HÜBNER. The operative treatment of myopia of high degree. *Sammlung zwangloser Abhandl. a. d. Geb. d. Augenheilk.*, edited by Vossius, iii., 3, Halle, Marhold, 1899.

557. JACKSON. Management of cases of high asimetropia. *Journ. Amer. Med. Assoc.*, Dec. 2, 1899.

558. CLARK. Astigmatism after cataract extraction. *Annals of Ophth.*, Oct., 1899.

559. TIMBERMAN. Excessive myopia ; when may we operate and what may we expect? *Journ. Amer. Med. Assoc.*, Nov. 4, 1899, and *Annals of Ophth.*, Oct., 1899.

560. SCHNEIDEMANN. Very high astigmatism. *Journ. Amer. Med. Assoc.*, Dec. 9, 1899.

HEINE (552) has had opportunity to make further microscopic examinations of myopic eyes. Six carefully studied eyeballs have shown him that the appearances of distortion at the optic-nerve entrance are brought about by the different relations of the sclera, choroid, and retina on one hand, and the lamina elastica on the other, to the forces which keep tense the posterior segment of the ball. In the peculiarity of the coats of the ball and their different conduct when the volume of the ball increases, lies the occasion of the conus formation. Even in the formation of a pure conus without atrophy of the choroid, the author's specimens indicate that we must assume a pressure or distortion atrophy of the choroid in the region of the conus.

HESS (553), in his fifth paper on the subject of accommodation, reports observations upon the near point. He found, first, that for scientific purposes the usual method of regarding the apparent and the actual near point as identical is not satisfactory, since his own near point determined by the usual method differs 1. D. from the near point as determined according to Scheiner's principle.

By methods which are above criticism he found that in his own eye the action of eserine did not perceptibly bring the actual near point closer. Finally, he showed by new experiments that the binocular and unocular near point lie equally distant from the eye.

v. HIPPEL (554) reported on 188 eyes operated on for myopia in the last 6½ years. Of these, 184 were examined again after a lapse of 1-6 years ; 11, or 6 %, subsequently had detachment of the retina which may be considered spontaneous. v. Hippel regards the operation as justifiable only when the patient is incapacitated for work by his myopia, even when the correcting glasses are worn. Myopes under thirty years of age were operated on by discission and subsequent linear extraction, and

those over thirty with a transparent lens by flap extraction without iridectomy. Secondary cataracts were cut through with the Esberg-Luer scissors-forceps.

GERHARDT (555) reports on 52 myopia operations done by Vossius, in 50 of which the result was in every respect good. One eye was lost by infection and one, previously diseased, by detachment of the retina.

According to HÜBNER (556), in the operation for myopia not only is the degree of myopia important but also the individual conditions in each particular case. In general the lowest limit is 14. D, but under certain conditions eyes with only 12-10. D may be operated on. In performing the operation special care is to be taken to avoid prolapse or loss of vitreous. Therefore the posterior capsule is to be protected carefully. The operation gives the highly myopic person a better acuteness of vision for distance and the ability to see well and without fatigue at every working distance that his employment may require. In the great majority of cases the progress of the myopia can be checked by the operation, but as regards the lessening of the danger of detachment a conclusive judgment cannot yet be given.

Under asimetropia JACKSON (557) would range greatly differing degrees of astigmatism as well as spherical ametropia. Each case should be made a study for itself, but he believes that with care and patience a large number of cases can be fitted with complete correction for each eye. This is, of course, more applicable to young people.

BURNETT.

CLARK (558) gives the statistics of thirty cases of extraction with astigmatism following at various periods after the operation. Comparing his own averages with those of Lippincott, who makes a small preliminary iridectomy, he finds that with the simple method he employs, the astigmatism is higher.

BURNETT.

In giving a general consideration to the subject of operations in high myopia, TIMBERMAN (559) relates a case of his own of a woman of thirty-five who had a myopia of -16 in R eye, which also deviated outward, condition of other eye not given. With the $-16\text{ V} = \frac{5}{11}$. A dissection was made and the lens evacuated after it had caused considerable disturbance. A tenotomy was also made. With $+2.5\text{ V} = \frac{5}{2}$ after the effect of the operation had subsided.

BURNETT.

SCHNEIDEMANN (560) reports a case of very high astigmatism as determined by the shadow-test; R, $+2\text{ D} - 20, 15^\circ$; L, $+2\text{ D}$

— 20, 178°. With these, vision was advanced from $\frac{1}{100}$, to $\frac{1}{30}$ R, $\frac{1}{40}$ L. It is to be regretted that no measurement of the cornea is given.

BURNETT.

VII.—MUSCLES AND NERVES.

561. SCHOUTE. A contribution to the knowledge of the torsion movements of the eye. *Med. Weekblad*, vi., p. 604.

562. PANAS. Motor ocular paralyses of traumatic origin. *Arch. d'ophth.*, xix., 11, p. 623.

563. KUNN. On disassociating ocular paralyses. *Beiträge z. Augenheilk.*, 41, p. 44.

564. BACH. Further investigations on the nuclei of the oculomotor nerves. *Graefe's Archiv*, xlv., 2, p. 266.

565. ROOSA. Concerning convergent strabismus. *The Post-Graduate*, Dec., 1899.

SCHOUTE (561) arranged the Muller apparatus so that both eyes could be measured simultaneously. The torsion was almost always alike in the two eyes. When the head was turned to the right or the left a symmetrical torsion occurred.

WESTHOFF.

As PANAS (562) stated in his paper before the International Ophthalmological Congress, the paralyses of the ocular muscles which arise from injury of the muscle are due in most cases to a stretching of the muscle fibres and perhaps of the nerves also, and not to a rupture of the muscle or detachment of its tendon, which cannot be produced experimentally in the dead subject. The paralyses of the ocular muscles due to fractures of the base are mostly of the abducens, which passes by the apex of the petrous portion of the temporal bone, the usual site of fracture, and therefore, as well as on account of its close connection with the wall of the inferior petrosal sinus, is especially endangered. The abducens is compressed either by the bone or by hemorrhage. In the former case the paralysis is immediate, in the latter, as in traumatic meningitis, it appears later. Inconstancy of the paralysis and its late appearance do not therefore indicate a nuclear lesion. The paralysis in children under ten years of age arises from hemorrhage and not from fracture, which cannot be produced in the dead subject or by the greatest compression with the forceps in the bodies of new-born infants. In such cases there is only meningeal hemorrhage, such as occurs in prolonged labor in primiparæ and after the use of forceps, and causes a paralysis of the

abducens, followed by a congenital squint, which according to statistics is not rare. The latter usually disappears within the first two years of life, but may persist to a later age.

V. MITTELSTADT.

KUNN (563) offers a number of case histories in which paralyzes of the ocular muscles were observed with evident loss of association of greater or less degree. The author terms this form dissociating paralysis. Apart from a simple or multiple paralysis, causing a loss of mobility in the direction of the action of the paralyzed muscle or muscles, there is a disassociation of other co-ordinated movements of the two eyes. Thus one eye performs movements in which the other eye does not take part, although except for this paralysis it had the power to do so. Almost all these paralyzes were found in tabic patients.

According to BACH's (564) investigations on man, monkeys, cats, mice, fishes, lizards, and various birds, the nucleus of the trochlearis is round or oval. It lies in opposition to the dorsal margin of the posterior longitudinal bundle. The fibres emerging dorso-lateral from the trochlearis nucleus apparently decussate completely. The trochlearis nucleus lies next the oculomotor nucleus.

HORSTMANN.

ROOSA (565) is among those who believe in *amblyopia ex anopsia* and consequently advocates correcting the defect of strabismus as early as possible, first giving glasses as early as the 2d or 3d year, and then, if the anomaly is not abolished by this, making a tenotomy as early as the 4th year. He advocates the Panas method of stretching the muscles before tenotomizing.

BURNETT.

Sections VIII.-XII. Reviewed by DR. R. SCHWEIGGER,
Berlin.

VIII.—LIDS.

566. MULDER. Blepharitis ciliaris and acarus folliculorum. *Ned. Tydschr. v. Geneesk.*, 1899, ii., p. 803.

567. WARSCHOWSKI. On the question of the relation of blepharitis to hyperopia. *Zehender's klin. Monatsbl.*, xxxvii, p. 476.

568. HOTZ. On blepharitis and hyperopia. *Ibid.*, p. 485.

569. FORTUNATI. A modification of Oettinger's procedure

for the relief of total trichiasis. *Bull. d. R. Accad. med. di Roma*, xxv., 3-7.

570. SCHAEFER. On the trichiasis operation with a pedunculated flap from the skin of the lid. *Inaug. Dissert.*, Giessen, 1899.

571. ROSELLI. Blepharoplasty done by a modified Dieffenbach process. Considerations on plastic operations on the lower lid. *Bull. d. R. Accad. med. di Roma*, xxv., 3-7.

572. SCHMIDT-RIMPLER. Fat hernias of the upper lid. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 297.

573. WERNER. Cases of congenital coloboma of the lower lid. *Inaug. Dissert.*, Tübingen, 1900.

574. WÜRDEMAN and MURRAY. Serpiginous syphilide of eyelid, forehead, and external nose. *Ophth. Record*, Nov., 1899.

575. HOTZ. Total symblepharon of the upper lid relieved by Thiersch skin-grafting. *Ophth. Record*, Nov., 1899.

MULDER (566) found balsam of Peru to be valueless in cases of acarus of the lid margin.

WARSCHOWSKI (567) made the same observation as Winselmann and regards as an etiological factor in producing the blepharitis that congestion of the eye which follows long-continued strain of the accommodation and often appears as a chronic hyperæmia of the conjunctiva.

According to HOTZ (568), the correction of hyperopia for the relief of blepharitis, which Winselmann has lately recommended, was advised by Roosa in 1876 (furthermore it was known of in Germany in 1867 as the journals show) and is habitually practised everywhere in America.

FORTUNATI (569) adds to the splitting of the lid according to Oettinger two incisions vertically upward, about 8 mm long, which permits of great displacement of the portion containing the ciliary margin, particularly at its ends. KRAHNSTÖVER.

SCHAEFER (570) gives a favorable report of the results obtained in the Giessen eye clinic by treating trichiasis by the implantation of simple or doubly pedunculated skin flaps into the intermarginal portion of the lid. The lanugo hairs upon the transplanted skin cause no trouble. 19 % of the patients operated on had been treated or operated on elsewhere, 5 % returned on account of relapses and were then treated by electrolysis or excision of the lashes.

ROSELLI (571) has slightly modified Dieffenbach's operation for cicatricial ectropium. KRAHNSTÖVER.

SCHMIDT-RIMPLER (572) removed a fat-containing fold of skin from both upper lids of a boy of nineteen. The swelling beneath the skin had varied in size and at the operation it was found to be continuous with the orbital fat through a defect in the orbicularis muscle that was probably congenital.

According to WERNER (573) coloboma of the lower lid, like coloboma of the upper, together with other anomalies of the eye and the neighboring region, is mostly the result of amniotic adhesions.

The interesting feature of the case reported by WÜRDEMAN and MURRAY (574) is that the serpiginous ulceration of the eyelid, forehead, and nose was first considered, from a lack of definite history, to be tuberculosis or lupus and so treated, once by a Thiersch graft, and administration of the mercuric bichloride. As they finally healed on increasing doses of the iodides, it is presumed that they were specific in spite of lack of definite data.

BURNETT.

HOTZ (575) reports another case in which he has successfully used a Thiersch graft for replacing the conjunctiva, after piercing the globe, in total symblepharon. The peculiarity of its application in this case is that the graft was applied over a thin plate or disk of lead which had been moulded to the form of the eyeball. This was inserted under the upper lid with the epithelial surface next the lead and the lid firmly fixed by sutures and a compress bandage. On removal of the bandage at the end of four days union of the graft was perfect. Some contraction took place, and a second graft was applied after mobilizing the upper lid. The patient can now wear an artificial eye.

BURNETT.

IX.—LACHRYMAL APPARATUS.

576. GALLEGA. On chronic dacryocystitis from rhino-scleroma. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 289.

577. STRZEMINSKI. A case of polypus of the lachrymal sac. *Graefe's Archiv*, xlix., 2, p. 339.

Affections of the lachrymal sac in cases of rhino-scleroma are in part an extension of the process from the nose and in part an ordinary dacryocystitis in consequence of stoppage of the lower portion of the duct. In such a case GALLEGA (576) found peculiar changes in the mucosa of the sac which could not be considered rhino-scleroma but which would probably have led to

it. The typical histological changes in the palpebral conjunctiva, which clinically resembled amyloid, have been described by Ewetzky, who found the bacilli present (*Beitr. z. Augenheilk.*, iii., 22, 1898).

According to STRZEMINSKI (577), polyps develop in the lachrymal sac only on a mucosa with chronic catarrh and a tendency to papillary proliferation. Besides the symptoms of simple catarrh of the sac, there is then a solid swelling of the region of the sac which cannot be changed by compression, but this condition is also found in cases of thickening of the entire mucosa or the walls of the sac. These polyps are very rare.

X.—ORBIT AND NEIGHBORING CAVITIES.

578. WERNICKE. Hydatid buzzing with echinococcus of the orbit. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 304.

579. ISSEKUTZ. Retrobulbar echinococcus. *Ungar. Beiträge zur Augenheilk.*, ii., p. 53.

580. GALLENGA. A contribution to the study of the congenital tumors of the orbit (congenital fibro-lipoma). *Arch. di Ottalm.*, 1899, vi., 5.

581. HITSCHMANN. A case of intermittent exophthalmus with extensive phlebectasiæ in the jugular veins. *Wiener klin. Wochenschr.*, 1900, No. 3.

582. GRUNERT. A new plastic method after the complete chiselling out of the frontal sinus for empyæma. *Münch. med. Wochenschr.*, 1899, No. 48, p. 1611.

583. ESCHWEILER. On empyæma of the frontal sinus. *Inaug. Dissert.*, Giessen, 1899.

584. OLIVER. Description of a new method for implantation of glass balls into the orbital cavity. *Philada. Med. Journ.*, May 27, 1899.

585. DAVIS. Report of a small round-celled sarcoma of the orbit and neighboring sinuses in a child: metastasis, exhaustion, death. *The Post-Graduate*, Dec., 1899.

586. BRYAN. On the relation of the accessory cavities to diseases of the eye. *Journ. Amer. Med. Assoc.*, Nov. 11, 1899.

587. AYRES. Traumatic enophthalmus. *Amer. Journ. of Ophth.*, Nov., 1899.

In WERNICKE'S (578) patient, exophthalmus and amblyopia had been increasing for six months. When the lids were closed tightly the patient heard for 5-8 seconds a loud buzzing sound. This could be heard by others when the ear was laid against the temple, but nothing could be felt. The diagnosis of echinococcus of the orbit was confirmed by operation.

ISSEKUTZ (579) described two cases of echinococcus of the orbit in children. The new formations had caused exophthalmus, pain, and diminution in vision. The operation wound healed smoothly after the vesicles had been incised.

ESCHWEILER (583) presents nine case histories of empyæma of the frontal sinus, due in four cases to influenza, in one case to measles, in one to trauma, and in two to chronic rhinitis. All the cases were in an advanced stage, with abscess formation particularly in the upper lid and once in the orbit. In six cases the eyes were affected secondarily, but were mostly restored after the operation on the sinus.

OLIVER'S (584) method of implantation of a glass ball into the capsule of Tenon after enucleation, consists in suturing the recti muscles with catgut sutures before the section of the tendons, in such way that after the detachment from the ball and the enucleation of the eye they can be brought easily over the implanted glass ball and be exactly in the line of their normal action. The conjunctiva, after being properly trimmed, is brought together with silk sutures.

BURNETT.

The case reported by DAVIS (585) confirms the opinion now generally held, that interference with malignant growths of the orbit and adjacent sinuses in children (his patient was two and a half years old) only hastens their development and growth. The tumor was a small round-cell sarcoma. There was no autopsy.

BURNETT.

In this paper, which is general in its character, BRYAN (586) discusses the relations of diseases of the accessory cavities, particularly the frontal and ethmoidal sinuses, to affections of the eyes, and relates in that connection the histories of the following cases: 1. Chronic frontal sinusitis, caries of the fronto-ethmoidal cells, orbital abscess, fistulous opening at the inner angle of the orbit. 2. Chronic frontal suppurating sinusitis and suppurating ethmoiditis, associated at one time with a pronounced orbital cellulitis. 3. Chronic abscess of the frontal sinus and ethmoidal cells followed by an irido-choroiditis. In all

cases of ethmoidal trouble he states that he has found some restriction of the visual field, diagrams of which are given in illustration. 4. Nasal polypi, alveolar sarcoma of the ethmoidal cells, later involving the orbit, purulent accumulation in the antrum. 5. Abscess of the sphenoidal sinus, associated with paralysis of both external recti. The operation for opening the abscess was followed by a cure of the paralysis of the right externus, but not the left. BURNETT.

AYRES'S (587) case of enophthalmus was in a man of thirty-five years, who was struck over the supraorbital region of the right angle with a broom handle ten months before. There followed severe swelling of the lids and orbital tissue. When the inflammation subsided the eye was found to have receded into the socket; motion inward unimpaired, outward limited, upward limited, downward abolished; media clear, od pale, V $\frac{1}{2}$ $\frac{5}{6}$, no rupture of choroid or detachment of retina. There was bleeding from the nose after the injury. This corresponds closely to a similar case reported in the same journal for July, 1899, by the reviewer.

BURNETT.

XI.—CONJUNCTIVA.

588. HAUER. On atropine conjunctivitis. *Ungar. Beitr. z. Augenheilk.*, ii., p. 247.

589. MARK. Clinico-experimental studies on so-called atropine conjunctivitis. *Ibid.*, p. 223.

590. SILEX. On the therapy of spring catarrh and of the conjunctivitis accompanying hay fever. *Die aerztl. Praxis*, 1899, No. 20.

591. FEUER. The operative treatment of trachoma. *Ungar. med. Presse*, 1899, No. 42-43.

592. TERSON, Sr. Granular conjunctivitis with complete pannus, cured by jequirity after the ordinary treatment had failed. *Ann. d'Ocul.*, cxxii., Nov., p. 322.

593. BADE. On primary tuberculosis of the conjunctiva. *Inaug. Dissert.*, Tübingen.

594. COPPEZ. A study of ocular diphtheria. *Arch. d'opht.*, xix., 10, p. 565.

595. BRECHT. The bacteriology of conjunctivitis. *Charité-Annalen*, xxiv., p. 376.

596. VAN FLEET. Purulent ophthalmia in private practice. *The Post-Graduate*, Dec., 1899.

597. HENDERSON. A case of tuberculosis of the conjunctiva. *Amer. Journ. of Ophth.*, Oct., 1899.

HAUER (588) and MARK (589) could not produce atropine conjunctivitis by using a $\frac{1}{2}$ -1 % solution on the normal conjunctiva, but readily produced it by using atropine in substance for twelve days on the normal conjunctiva, and often by making a single application to the irritated or wounded conjunctiva. It is, therefore, the high concentration of the atropine that causes the trouble.

FEUER (591) regards the operative treatment of trachoma by Heistrath's method as a great advance in the therapy of the disease, and states its indications as follows :

1. Pannus, when unrelieved by the ordinary treatment.
2. Thickening of the curved margin of the upper cartilage and the overlying conjunctiva in cases that are healed or nearly so, especially when the patient has no opportunity for regular treatment.
3. Curvature of the cartilage, so that the portion of the orbicularis lying in an oblique plane contracts and presses the inner margin of the lid upon the cornea. A few days after the operation, the eye opens freely and the cornea is smooth and lustrous.
4. Ptosis following trachoma, in consequence of the affection of Müller's muscle by the chronic inflammatory process. The author believes that this excision of the cartilage could be used in idiopathic ptosis, for which no altogether satisfactory operation has yet been devised.

HERRNHEISER.

COPPEZ (594), in a very interesting paper based on recent reports and his own experiences, discusses in a clear and comprehensive manner the still disputed question as to the identity of croup and diphtheria of the conjunctiva ; the distinction between the Loeffler bacillus and the other bacilli found in the conjunctival sac under normal and pathological conditions ; and finally the action of toxines upon the cornea. The details must be read in the original.

BRECHT (595) reports on a case of mixed infection with the pneumococcus and the diphtheria bacillus, a case in which pseudogonococci were found, a case of a child with gonorrhœal conjunctivitis with gonococci in the nasal pus, and finally the case of a boy in whom a gonorrhœal conjunctivitis was twice followed by

an acute hemorrhagic nephritis with gonococci in the urine, which the author regards as metastatic.

Of the nine cases which form the basis of VAN FLEET'S (596) paper, eight were oph. neonat., and the remarkable feature of their histories is that it is stated that in all eight the method of Crede had been used. This must certainly be an erroneous statement or the method was very inefficiently applied. As the author says, very properly, it is necessary that it be done *secundum artem* to be absolutely sure. BURNETT.

HENDERSON (597) reports a case of tuberculosis ulcer in the conjunctiva of the lid of a woman of fifty-six, who was suffering from tuberculosis of the lungs. Giant cells and the bacillus were found in the discharge and also in the tissue which was removed. Cauterization of the parts after excision of the diseased tissue was followed by a healing of the ulcer. BURNETT.

XII.—CORNEA.

598. DIMMER. On superficial grill-like opacity of the cornea. *Zeitschr. f. Augenheilk.*, ii., p. 354.

599. WICHERKIEWICZ. A fungus affection of the cornea. *Arch. f. Augenheilk.*, xl., 4, p. 361.

600. STRAUB. Treatment of ribbon-shaped keratitis. *Ned. Tijdschrift v. Geneeskunde*, 1899, ii., p. 593.

601. HIPPEL, E. Ulcer of the posterior surface of the cornea (Ulcus internum corneæ). A contribution to the knowledge of congenital opacities of the cornea and of megalophthalmus and hydrophthalmus. *Festschrift für A. v. Hippel*, Halle, Marhold, 1900.

602. COPPEZ, H. The action of certain toxines on the cornea. *Gaz. hebdom.*, 1899, 1172, and *Four. méd. de Bruxelles*, 1899, No. 35. Cf. *Arch. f. Augenheilk.*, xl., 2, 199 and 1, 104.

603. BLASKOWICZ. The tumors of the cornea. *Ungar. Beitr. z. Augenheilk.*, ii., 131.

604. DEMICHERI. Papilloma of the cornea. *Arch. d'ophth.*, xix., 10, p. 561.

605. KRUKENBERG. Further reports on congenital bilateral melanosis of the cornea. *Klin. Monatsbl.*, xxxvii., p. 478.

606. KETTERL. Two cases of cilia in the anterior chamber. *Inaug. Dissert.*, Munich, 1889.

DIMMER (598) observed three cases of grill-like opacity of the cornea in three sisters between forty-seven and fifty-seven years of age, who had had the affection for twenty or thirty years. He obtained a history of chronic catarrh only, probably conjunctival; there were no scars in the corneæ. The corneæ were uneven from the deposition in them of punctate hyaline masses, and crystals in the stroma of the cornea and Bowman's membrane were arranged in a meshwork, giving the effect of fissures. The disturbance of vision was considerable.

In WICHERKIEWICZ'S (599) patient, after a trauma, there developed a thick white mass on the cornea with vascularization of the margin and hypopyon. The irritation was only slight, but the vision was much reduced. The mass on the cornea was composed of penicillium glaucum adhering to the surface of the cornea without entering the tissues, and disappeared after removal of a portion.

According to STRAUB (600), in ribbon-shaped keratitis there is a deposit in the epithelium of colloid, hyalin, or lime. This deposit can be shaved off with a Graefe knife, and the cornea then becomes covered with a healthy epithelium. WESTHOFF.

HIPPEL (601) observed in young infants with abnormal corneæ large, cloudy, conical ulcers, staining with fluorescein, on the posterior surface of the cornea, without vascularization or change in the superficial epithelium. The disease is distinguished from parenchymatous keratitis by the fact that it begins at the margin. It is frequently familial and as a rule bilateral. A cornea thus affected may become normal again.

BLASKOWICZ (603) reports a case of granuloma and gives a résumé of the literature of primary tumors of the cornea, *i. e.*, those not due to extension from other tissues. These are: (1) granuloma, which arises in the stage of repair of corneal ulcers or through the accumulation of lymph cells at some point in the cornea; (2) keloid and connective-tissue hyperplasias, partly of myxomatous structure; (3) fibroma lipomatodes, (4) melanoma, and (5) dermoid.

DEMICHERI (604) removed from a man of sixty, who had previously suffered from trachoma, a papilloma which, in the form of a bilobulated tumor, occupied the upper third of the cornea. The neighboring conjunctiva was quite vascular, but otherwise unaffected. After the first removal there was speedy recurrence. The tumor was readily peeled off the cornea and was firmly

attached at the limbus only. It was composed almost exclusively of cells without any remains of Bowman's membrane. Its structure was that of slight papillæ of connective tissue and blood-vessels surrounded by a proliferating layer of cylindrical cells and superficial layers of flatter cells. V. MITTELSTAEDT.

KRUKENBERG (605) reports two further cases of brownish discoloration of a vertically oval area in the middle of the cornea. He takes this to be a product of abnormal development of the anterior portion of the uveal tract.

Sections XIII.—XVIII. Reviewed by DR. O. BRECHT, Berlin.

XIII.—LENS.

607. KNAPP, P. Experimental investigations on the procedures for producing cataract artificially without rupturing the anterior capsule. *Zeitschr. f. Augenheilk.*, ii., p. 553.

608. SCHMIDT-RIMPLER. On binocular and stereoscopic vision, with unilateral aphakia and unilateral acuteness of vision, as regards accident legislation. *Weiner med. Wochenschr.*, xlix., No. 43, p. 1975.

609. GUTMANN, G. On the operative treatment of complicated cataract. *Arch. f. Augenheilk.*, xl., p. 238.

610. BAKER. A case in which both eyes were lost from choroidal hemorrhage subsequent to the extraction of senile cataract. *Annals of Ophth.*, Oct., 1899.

611. THEOBALD. Report of one hundred consecutive cases of cataract extraction. *Amer. Jour. of Ophth.*, Dec., 1899.

P. KNAPP'S (607) experiments lead him to regard the operation recommended by Jocqs (injection of aqueous humor into the lens with a hypodermic syringe) as much more difficult technically and more dangerous than simple discission.

According to SCHMIDT-RIMPLER (608) aphakic patients, notwithstanding good sight with correcting glasses and the existence of binocular vision, have not an exact perception of depth, and children are even more uncertain than adults. On the other hand, the disturbance in the estimation of depth when the vision of one eye is even considerably reduced, is mostly slight, or is not perceptible.

GUTMANN (609) finds that in 75 per cent. of 45 operations for complicated cataract a more or less considerable increase in vision was obtained.

In the case related by BAKER (610) the first eye was lost on the sixth day after extraction, from intraocular hemorrhage. A year later the patient desired the other eye to be operated upon. Every precaution against hemorrhage was taken. The patient was kept perfectly quiet and carefully watched after the extraction, which had been preceded some weeks by an iridectomy that had pursued a normal course. Within an hour she suddenly complained of intense pain, and on removing the dressing the vitreous was found hanging in the wound, pushed out by blood from behind. Immediate enucleation was declined. BURNETT.

Of the 100 extractions tabulated by THEOBALD (611), 52 were Graefe, 26 with preliminary iridectomy, 20 simple, and 2 in the capsule (dislocated lenses). He has practically abandoned the simple method, doing a small iridectomy. There were 90 successes, and 2 losses from suppuration, both complicated cases. BURNETT.

XIV.—IRIS.

612. COX, G. H. Total aniridia ; two cases—one traumatic, one (with ectopia lentis) congenital. *Med. Record*, Dec. 16, 1899.

613. BEARDSLEY. Introversion of the iris. *Amer. Jour. of Ophth.*, Oct., 1899.

614. AYRES. Serous cyst of iris following dissection for milky cataract. *Four. Amer. Med. Assoc.*, Nov. 18, 1899.

The case of traumatic aniridia, reported by COX (612), is interesting, in so far as the wound in the sclero-corneal junction was very small, and no trace of the iris was seen immediately after the injury, or at any subsequent time. The disappearance of the iris tissue was total. In the congenital case, which was double, there was associated an upward dislocation of the cataractous lenses. BURNETT.

In BEARDSLEY'S (613) case, a man of thirty-four years was struck violently on the eye. Ant. chamb. was filled with blood and there was a scar on the upper part of the cornea. Iris not visible, neither were the ciliary processes. The lens was absorbed. Some floating opacities in the vitreous. Final vision, with $+ 12 = \frac{5}{15}$. He records another similar case of retroversion of iris with dislocation of lens from a blow. Communicated by Dr. Barcle. BURNETT.

In AYRES'S (614) case a boy of six was operated on, for lamellar cataract, by iridectomy in 1880. It 1895 the cataracts had

matured and were incised and absorbed successfully. In 1897 a cyst about 5 mm in diameter was found on the iris of the right eye at the lower-inner quadrant. A piece of the iris containing the cyst was excised. Vision, however, gradually failed, probably from some slow degenerating process. BURNETT.

XV.—CHOROID.

615. POWELL. A contribution to the knowledge of choroidal sarcoma. *Graefe's Archiv*, xlix., p. 71.

POWELL (615) reports on 100 cases, comprising 0.07 % of the total number of polyclinic cases. The most frequent age was fifty-one to sixty years, the youngest patient was seven. 47 % were men, 53 % women. The tumor originated in the iris in 2 %, ciliary body 10 %, and choroid 88 %, and was almost without exception unilateral. It is noteworthy that leucosarcoma is found mostly in the anterior portion of the uveal tract and melanosarcoma in the posterior. The average age of the patient with leucosarcoma was 34.67 years, and of the patient with melanosarcoma 48.7 years, the former appearing earlier in life. Anatomically, 5 % are pure round-celled sarcomas. Etiologically, trauma cannot be considered a sufficient cause for the growth. Prognostically, sarcoma of the iris is not so bad as the others, since it is discovered early and perhaps may be cured by iridectomy. 10 % of the patients operated on suffered relapses mostly within six months, once thirty years later in the stump remaining after enucleation. The patient who has no recurrence within four years can be counted definitely cured. [Death from metastasis has occurred as late as fourteen years.—H. K.] Curiously, metastases were relatively more frequent in the patients operated on early.

XVII.—GLAUCOMA.

616. TERRIEN. The effect of posterior sclerotomy in glaucoma. *Arch. d'opht.*, xix., 12.

617. DOMEK. The treatment of glaucoma by massage. *Clin. Opthl.*, No. 19, p. 221.

618. ALLARD. The treatment of chronic glaucoma by galvanization of the cervical sympathetic. *Ibid.*, No. 20, p. 229.

619. JATROPOULIS. A case of unilateral glaucoma with resection of the superior cervical ganglion. *Ibid.*, p. 233.

620. ROGMAN. Is iridectomy of service in simple chronic glaucoma? *Ibid.*, p. 231.

621. ZIMMERMANN (Stuttgart). A case of resection of the superior cervical ganglion of the sympathetic. *Ibid.*, p. 232.

622. DE SCHWEINITZ. An analysis of 63 eyes affected with chronic glaucoma, with special reference to the visual field. *Annals of Ophth.*, Oct., 1890.

623. RISLEY. Glaucoma in an aphakic eye three years after extraction. *Amer. Journ. of Ophth.*, Nov., 1899.

624. SUKER. Excision of the superior cervical ganglion of the sympathetic for glaucoma, with a report of a case. *Ophth. Record*, Oct., 1899.

625. RICHEY. The nature of acute and of chronic glaucoma. Their common origin. *Philada. Monthly Med. Journ.*, July, 1899.

TERRIEN (616) found in an eye in which posterior sclerotomy had been done twice for hemorrhagic glaucoma with transitory effect, that the wound in the sclera, choroid, and retina had remained open although the enucleated eye was very hard. Terrien would explain this hardness by an œdema of the vitreous, and believes that in cases like this in which iridectomy and anterior sclerotomy had not relieved the tension, the most rational procedure would be the removal of a portion of the vitreous.

V. MITTELSTÄDT.

Nothing more than the gist of the résumé of the exhaustive study of the visual field in glaucoma made by DE SCHWEINITZ (622) can be given here. While in the typical cases of chronic glaucoma the nasal half of the field is first affected—a composite picture of a number of fields will show a general restriction rather than a restriction in one direction. The color fields are usually more contracted proportionately than the field for form. The scotomas, which can usually be found by careful examination in a subdued light, may be ring-shaped, crescentic, paracentral or disseminated, and are frequently the forerunners of large defects. The cases are well tabulated and there are forty-five diagrams of visual fields given.

BURNETT.

In the case detailed by RISLEY (623) the operation was a simple extraction, in which, however, the iris became adherent to the capsule and when the first attack of glaucoma occurred three years after the extraction (during which time V was good, being

$\frac{6}{8}$ after a capsulotomy, made six months after the first operation), the iris was *bombé* and evidently pressing on Fontana's space. The first attack of glaucoma was cured by eserine, rest in bed, and salicylate of soda. Six months later, however, another attack of glaucoma necessitated an iridectomy, the result of which has been satisfactory so far. V is now $\frac{6}{8}$.

BURNETT.

SUKER (624) reports a case of removal of the superior cervical ganglion in a case of glaucoma, which had already been operated upon by iridectomy, giving temporary relief. The pain returned with increased severity and yielded to none of the ordinary remedies. The removal of the ganglion gave relief to the pain up to the time of reporting (less than three months). The tension was reduced.

BURNETT.

RICHEY (625) reports six cases of glaucoma in support of his contention that glaucoma is a manifestation of gout.

BURNETT.

Sections XIX.-XXII. Reviewed by PROF. GREEFF, Berlin.

XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

626. MUNTENDAM. A case of quinine blindness. *Ned. Oogheelkundige Bydragen*, Abl. viii., p. 73.

627. STRAUB. Blindness from quinine poisoning. *Ned. Tydschr. v. Geneeskunde*, 1899, ii., p. 744.

628. MICHEL. On affections of the retinal vessels with particular reference to the pathological changes. *Zeitschr. f. Augenheilk.*, ii., July, 1899.

629. SEYDEL. On disturbances of circulation in the retina. *Ibid.*, Oct.

630. BULL. Pathological changes in the retinal vessels. *Tidskr. for den norske Lægeforening*, Jan. 15, 1900.

631. SCHROEDER. Pathogenesis and therapy of spontaneous detachment of the retina. *Zeitschr. f. Augenheilk.*, ii., July, 1899.

632. SILEX. A contribution to the knowledge of some rare anomalies of vision. *Ibid.*, Aug.

633. RAEHLMANN. On relative and absolute lack of color perception. *Ibid.*, ii., Oct. and Nov.

634. DRUAULT. A case of detachment of the retina followed by glaucoma. Ulcer of the cornea coming on some days before enucleation. *Arch. d'ophth.*, xix., 11, p. 625.

635. BURNETT. A case of obstructed retinal circulation with a series of pictures showing the changes in the vascular system during the re-establishment and the formation of new vessels in the retina. *Ophth. Record*, Dec., 1899.

636. FOX, W. H. Injuries to the eyes from electric light flash. *Four. Amer. Med. Assoc.*, Oct. 7, 1899.

637. GIFFORD. Thrombosis or embolism of the central artery of the retina after ligation of the vessels of the neck. *Ophth. Record*, Dec., 1899.

638. PATILLO. Two cases of methyl alcohol amaurosis from inhalation of the vapor. *Ibid.*

639. HOLDEN. The pathology of the amblyopia following severe hemorrhage and that following the ingestion of methyl alcohol, etc. *Arch. f. Augenheilk.*, xl., p. 351.

640. MOORE. A clinical lecture on hysterical blindness. *The Post-Graduate*, Dec., 1899.

641. NELSON. Temporary blindness after intense inflammation—result of lightning. *Ibid.*

STRAUB'S (627) patient took three grammes of quinine at a single dose. Three hours later he was very ill and blind. Marked œdema of the retina was found with the ophthalmoscope. Three weeks later pupillary reaction returned and twelve days later perception of light. The visual fields were very narrow. Gradual improvement.

WESTHOFF.

MICHEL (628) gives a clinical and anatomical report on four cases of disease of the central artery and vein. In the first case there was the ophthalmoscopic picture of embolism of the central artery. There was found in general an extensive atheroma of the arteries of the body, as well as hypertrophy of the left ventricle. Death occurred five weeks later. An endarteritis proliferans of the central artery was found, the intima being everywhere thickened. Just behind the lamina cribosa the lumen was blocked apparently by a thrombus.

In Case 2, of albuminuric neuro-retinitis with numerous hemorrhages and white patches, the central artery contained a thrombus.

In Case 3, the central vein contained a thrombus extending through its entire course in the optic nerve..

Michel concludes that the picture of so-called embolism of the central artery can be produced by thrombotic stoppage of the artery. Thrombosis follows endarteritis proliferans, but it is possible that the changes in the intima may alone cause the blocking.

Thrombosis of the central artery may arise in two ways : either in the form of a marantic or of a pressure thrombosis. Hemorrhagic retinitis may be caused (1) by a marantic thrombus of the central vein ; (2) by phlebitis blocking the lumen ; (3) by an extensive affection of the veins of the retina, particularly those of middle calibre, in the form of phlebitis proliferans with narrowing or closure of the lumen. In 1 the veins are enlarged and tortuous ; in 2 and 3 the veins are rather narrowed.

The ophthalmoscopic picture of albuminuric retinitis is the expression of circulatory changes and lesions of the tissues of the retina caused by a primary arterio- or phlebo-sclerosis of the central vessels.

SEYDEL'S (629) patient, a woman of thirty-one, after a short walk suddenly noticed a cloudiness of vision in the right eye. Many of the veins were markedly tortuous and at points enclosed in chalky white sheaths, so that the vessel appeared like a white stripe. There were numerous hemorrhages. The picture resembled that described by Michel as sclerotic and atheromatous degeneration of the retinal vessels.

The author further described a typical partial embolism in a woman of twenty-seven. There was a milky-white opacity of the retina in the region supplied by a small vessel whose blood column was seen to be interrupted.

OLE BULL (630) believes that the pathological changes ophthalmoscopically visible in the retina have not been sufficiently studied and not enough attention has been given to them. Many cases of visual disturbance after trauma are due to spasmodic conditions of the retinal vessels. Ophthalmoscopically one sees at times partial contractures which change from day to day. Analogous changes may occur when the vessels are diseased without a preceding trauma. The author believes that the so-called syphilitic choroiditis depends upon primary changes in the retinal vessels.

DALÉN.

SCHROEDER (631) presents a critical review of the literature concerning the pathogenesis and therapy of spontaneous detachment of the retina. As to pathogenesis he distinguishes :

- I. The secretion theory (Arlt and others).
- II. The shrinkage theory (H. Müller and others).
- III. The diffusion theory (Raehlmann and others).
- IV. The new Deutschmann theory.

Therapeutics are divided into operative and non-operative. In the former category, he described the mechanical treatment by a bilateral-pressure bandage introduced by Samelsohn in 1875, and the Heurteloup leech, inunction treatment, and particularly diaphoresis.

The operative treatment goes back about forty years to puncture of the retina proposed by von Graefe in 1857, followed by puncture of the sclera with the purpose of allowing the escape of the subretinal liquid (Sichel, v. Graefe), and later continued drainage, particularly that by means of de Wecker's gold wire. In conclusion he describes in detail the operative procedures of Schöler and Deutschmann.

SILEX (632) describes: 1. A case of bilateral incomplete homonymous hemianopsia coming on at once. The patient, a man of sixty-two, on arising one morning suddenly saw everything veiled. There was a small field downward in each eye, including the point of fixation. 2. Two cases of minimal central field of vision in advanced optic-nerve atrophy. 3. Ring scotoma. A man of fifty-two had acquired syphilis twenty-four years before. Only near the disc was there a slight indication of sclerosis of the choroidal vessels. In each eye was a ring scotoma easily demonstrable, of fairly equal size, and remaining unchanged after an interval of six months.

RAEHLMANN (633) states that all the cases of so-called total color-blindness which have been subjected to physiological investigation had diminished acuteness of vision and other disturbances. In fact all these eyes were pathological. Therefore Raehlmann's examination of a case of total color-blindness in eyes otherwise normal is of great importance; the results of his detailed examination, however, cannot be satisfactorily presented in an abstract.

In the eye examined by DRUAULT (634) the retina was detached up to the ora serrata and ruptured above. On the anterior surface of the retina, downward, near the ora serrata, was a network of capillary vessels several layers deep. The vitreous had undergone a fibrillary degeneration and was tightly adherent to the retina where the vessels lay. This case illustrated the

effect of vitreous traction upon the retina. No choroidal changes which could have caused the shrinking of the vitreous were found.

V. MITTELSTÄDT.

In the case reported by BURNETT (635), a man of eighty-five was suddenly blinded in the right eye. Seen a few hours after the accident, the fundus presented a typical picture of so-called embolism of the central retinal artery. There was some vision left, principally down below and to the right. The peculiar vascular changes as observed through a year, were the obliteration of the principal arteries, hemorrhages in the retina, and afterwards refilling of old vessels or formation of new ones, and clumps of small capillaries along the lines of the obliterated arteries, and not at the seats of the former hemorrhages.

BURNETT.

Fox (636) reports a case of eye injury from electric-light flash from a current of 500 volts. There was momentary blindness, after which the man continued his work, and during the evening read the newspaper. At midnight he was awakened by great pain, and when seen by Fox at that time, there was much congestion of the conjunctiva and some redness of the lid and a pinhole pupil. Under cocaine the symptoms soon subsided and recovery was rapid. Fox discusses the various theories that have been advanced to account for the phenomena, and concludes that the most plausible one is that there is an intense irritation of the retina from the light rays, causing an instantaneous hypercontraction of pupil and ciliary muscle, followed by a temporary paralysis of the ciliary nerves.

BURNETT.

In GIFFORD'S (637) case the patient was found to be blind after an operation on the tonsil of the left side, which necessitated the ligation of both carotids and the jugular vein. Gifford found a typical picture of so-called embolism of the central retinal artery. He thinks that, like similar cases reported by Siegrist, Graefe, and others, the closure of the retinal vessel is due to a thrombosis starting at the point of ligation in the vessels of the neck.

BURNETT.

PATILLO (638) reports two cases of poisoning by methylic alcohol in two painters who were working in the fumes in a confined space. In one case the total blindness lasted for a week, then sight returned somewhat, but finally gave way to only p. l. in one eye, and finger-counting at three feet in the other. In his

partner the sight gradually improved from total blindness to fingers at one and three feet respectively. Retinal vessels normal, discs white. BURNETT.

MOORE (640) reports three cases of hysterical blindness in the male sex; one of both eyes, the other two of one eye each. They presented the typical picture of the affection as seen in women. All three were cured by producing a sudden shock on the nervous system, once by a strong electric current, twice by etherization, the patients being positively assured beforehand that a cure would result. BURNETT.

In the case given by NELSON (641) a man was standing by a dynamo while a thunderstorm was raging. During a flash of lightning he was thrown down, and remained unconscious for some minutes. On recovery he was unable to see, nor could he bear the light to fall on the eyes, so great was the photophobia. Pupils were much contracted, and there was a conjunctivitis and keratitis which persisted, as did the photophobia, for weeks. It was more than ten weeks before he could do even light work. The final recovery, however, was perfect. BURNETT.

XX.—OPTIC NERVE.

642. MENDEL. On section of the optic nerves. *Deutsche med. Wochenschr.*, Nov. 6, 1899, p. 991.

643. SEGGER. A cured affection of the chiasm with remarks on the location of the nerve fibres in the chiasm. *Arch. f. Augenheilk.*, xl., p. 53.

644. DALÉN. Optic neuritis and acute myelitis. *Graefes Archiv*, xxviii., p. 672.

645. BAAS. The origin of choked disc. *Zeitschr. f. Augenheilk.*, ii., August, 1899.

646. WEEKS. The papillitis of brain tumor. *Fourn. Amer. Med. Assoc.*, Dec. 23, 1899.

Rupture of the optic nerves without injury to the eyeballs is rare, according to MENDEL (642), but when it does occur the clinical picture is as clean-cut as after an experiment on animals. The optic nerve is a portion of the brain pushed forward, and its fibres once divided never reunite (Gudden's law). The ophthalmoscopic picture differs according to the location of the rupture, whether close to the ball and involving the central artery or

farther back in the orbit. When the rupture occurs near the ball, a picture is seen resembling that following embolism of the central artery. Mendel reports a case of rapier injury of the nerve farther back in the orbit. The sight was lost at once, but the fundus was normal. The temporal half of the disc began to grow pale ten days later. The injury may take place at the apex of the orbit or in the bony canal. Changes in the disc are then longer delayed. The complete blindness which appears at once may be recovered from wholly or in part, but often the eye remains blind. A definite prognosis cannot usually be made directly after the injury.

SEGGER (643) reports the case of a woman of twenty-three in whom he found in both temporal halves of the visual fields, besides an absolute peripheric defect, a larger temporal-hemianopic defect. Since the smell was normal and there was a paresis of the left oculomotor nerve, it was assumed that there was pressure on the posterior portion of the chiasm probably due to inflammation. Under treatment with iodide of potassium the defect in the fields grew less until only a symmetrical relative paracentral scotoma remained. Fifteen months later there was a relapse and almost the entire temporal halves of the fields were lost, but finally there was almost complete recovery.

In a detailed paper DALÉN (644) described a case of acute myelitis with optic neuritis observed in Professor Fuchs's clinic in Vienna. The association of these two conditions was first described by Erb in 1879. A healthy man after exposure suddenly experienced a disturbance of vision in his left eye and a fortnight later in his right. A month later the lower extremities became paralyzed, and there soon developed the picture of acute ascending myelitis, which caused the patient's death three weeks later. At the autopsy there was found myelitic softening of the lumbar and dorsal portions of the cord, and a lesser degree of softening of the cervical portion, while the medulla and brain macroscopically exhibited no changes.

The medullary sheaths of the intraorbital portion of the left optic nerve, of the intracranial portions of both nerves, the chiasm and neighboring portions of the tracts had completely disappeared. There were numerous fatty granular cells present and marked interstitial changes.

BAAS (645) gives a good résumé of the various theories offered to explain the development of choked disc. He takes a middle

ground between the Schmidt-Manz œdema theory and the Leber-Deutschmann inflammation theory.

A consideration of 677 published cases of choked disc leads WEEKS (646) to the opinion that this symptom is of value only when there are other corroborating symptoms of brain tumor. He reports the results of the microscopic examination of five cases of his own, in all of which the intervaginal space was distended. He believes that there are two forms of papillitis—one an œdematous form such as was found in his cases, and the other a true inflammatory form.

BURNETT.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

647. BRANDENBURG. A contribution to the subject of gun-cap injuries of the eye. *Sammlung zwangloser Abhandlungen*, iii., part 4, Halle, C. Marhold.

648. JOHNSON. Report of a case of removal of steel from the eyeball and exhibition of a new portable magnet. *Ophth. Record*, Nov., 1899.

BRANDENBURG (647) reports a case of injury from a gun-cap. There was a small clean wound in the upper lid corresponding to a wound at the upper margin of the cornea. The vitreous was so cloudy that no reflex was obtained. On the third day a 3-mm long splinter of copper presented in the wound in the lid and was removed. This seemed to nullify the diagnosis of foreign body within the eye, but as chemosis developed and a yellow reflex was obtained from the interior and accommodation in the other eye became affected, enucleation was done on the thirteenth day. A second splinter of copper was found imbedded in pus in the vitreous.

JOHNSON (648) reports the successful removal of a piece of steel from behind the iris by a new magnet which he exhibited. The size of the instrument is not given. The cone is made of soft Norway iron and wound to 140 ohms resistance with No. 28 single silk-covered magnet wire, one half in one direction, the other half in the other, the two coupled by two bottom wires. The conduction cord is attached to the ordinary Edison plug.

BURNETT.

XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

649. PRAUN and PRÖSCHER. A further case of acromegaly and investigations on metabolism in this disease. *Graefe's Archiv*, xlviii., p. 375.

650. VOSSIUS. On the inheritance of ocular diseases, with particular reference to optic neuritis in consequence of heredity and congenital disposition. *Sammlung zwangloser Abhandlungen*, iii., part 6, Halle, C. Marhold.

651. BIHLER. A case of lead amblyopia. *Arch. f. Augenheilk.*, xl., p. 274.

652. WALLER. On skin and eye affections in persons who work with hyacinth bulbs. *Zehender's klin. Monatsbl.*, xxxvii., p. 480.

653. MEYER. A case of abortion for albuminuric retinitis. *Zeitschr. f. Augenheilk.*, ii., Oct., 1899.

654. WINTERSTEINER. A contribution to the subject of injuries to the eye during birth. *Ibid.*, ii., Nov., 1899.

655. SCHWARZ. On hemiopic pupillary reaction. *Ibid.*, Dec., 1899.

656. HEILMAIER. A contribution to the subject of the relation of ocular to nasal affections. *Ibid.*

657. WALTON and CHENEY. Tumor of the pituitary body. *Boston Med. and Surg. Jour.*, Dec. 7, 1899.

658. SEITZ. Anomalous pupillary reaction in meningitis. *Med. Record*, Dec. 2, 1899.

659. BRUNSON. Relative frequency of iritis in syphilis and rheumatism observed in three thousand cases. *Ophth. Record*, Nov., 1899.

660. VAUGHAN. Malarial infection as a factor in causing eye disease. *N. Y. Med. Jour.*, Dec. 16, 1899.

Last year PRAUN (649) presented two cases of acromegaly to the Ophthalmological Society. He now reports, with PRÖSCHER, a third case. The patient was a woman of thirty-five, who had noticed enlargement of her body for ten years. There was pallor of the temporal halves of the discs and concentric contraction of the visual fields. In two of these cases investigations in regard to metabolism were undertaken. It was found that the amount

of nitrogen given off was diminished but that otherwise metabolism was normal.

VOSSIUS (650) observed three cases of typical retrobulbar neuritis of hereditary origin, in two brothers and a nephew. Their uncle and two great uncles had been affected similarly, only the male members of the family having the disease. None of the patients became entirely blind. Vossius offers the usual explanation that there might be narrowing of the optic canal from hyperostosis due to inflammation.

BIHLER (651) describes a case of hemiachromatopsia due to lead poisoning. Three similar cases have been described. It is probable that the optic tract was affected. The author made an examination of the optic nerves of a man with lead poisoning in whom amaurosis had developed suddenly. There was no considerable atrophy of the optic nerves. The etiology of lead amblyopia is still obscure.

In the Haarlem tulip nurseries it is found that in August and September the workmen often suffer from an irritation of the skin and eyes. The dust from dry bulbs had been credited with causing the irritation. WALLER (652) found in this dust numerous worms and hard needle-shaped crystals. The larvæ of these worms develop in August and September and doubtless bore into the skin and die there.

In the fourth month of her second pregnancy, MEYER'S (653) patient developed an albuminuric retinitis and vision failed rapidly to $R\ V = \frac{1}{100}$, $L\ V = \frac{1}{30}$. In the next three days the vision failed further and an abortion was induced. The albumen in the urine diminished, but vision remained reduced to perception of movements of the hand.

WINTERSTEINER (654) examined microscopically the eyes of an infant that had been delivered with forceps. The conjunctivæ were suffused and the anterior chamber filled with blood. The redness of the conjunctivæ gradually passed off, but hemorrhages from the nose continued, and the infant died a week after birth. At the autopsy a fracture of the ethmoid bone was found and lesions of the mucosa of the ethmoid cavities.

Microscopically, numerous hemorrhages were found in the ciliary bodies and in the suprachoroidal space anteriorly. The hemorrhages usually found in the eyes of the new-born are in the posterior segment of the ball, and these hemorrhages, localized to the anterior segment, were doubtless due to the pressure of the forceps.

SCHWARZ (655) criticises Silex's statement that hemiopic pupillary reaction, a symptom highly regarded by the neurologists, in fact does not exist. Strictly speaking, Silex is right, since it is impossible to prevent an excitation of the functioning half of the retina by reflected light. But one is justified in speaking of a hemiopic pupillary reaction where a marked difference in reaction is noticed with illumination of each half of the retina. The examination must be very carefully made and Haab's cortical reflex excluded.

HEILMAIER (656), from the records of the Wurzburg clinic for eight years, deduces the following conclusions:

1. Diseases of the tear passages are regularly accompanied or caused by disease of the nose, most frequently atrophic rhinitis.
2. The eczematous diseases of the eye are regularly associated with eczema of the nasal mucosa.
3. Conjunctivitis and its complications may be caused by various diseases of the nose.
4. Serpentine ulcer of the cornea is usually accompanied only by the nasal affections found together with dacryocystoblenorrhœa.

In the case reported in great detail by WALTON and CHENEY (657), the patient, a man of twenty-six when the disease first manifested itself, was affected with acromegaly and peculiar eye symptoms. These latter were, aside from dimness of vision, attacks of temporary hemianopsia associated with migraine. Later there was a permanent hemianopsia involving first the temporal field of one eye, and later extending to the nasal field of the other. There was loss of color sense (hemiachromatopsia) in the otherwise unaffected field of one eye. A tumor involving the sella turcica was found, 2.7 *cm* by 3.5 *cm* by 3 *cm*, and pressing on the chiasm. Unfortunately the chiasm, nerves and tracts were not removed for examination.

BURNETT.

The anomalous condition of the pupil in SEITZ's (658) case is that in a patient affected with tuberculous meningitis the pupils opened widely under intense light and contracted in darkness. No explanation is offered.

BURNETT.

BRUNSON (659) has gathered statistics from physicians practising in Hot Springs, Ark., as to the relative frequency of iritis in syphilis and rheumatism, taking 1500 cases in each disease. He finds 48 cases of iritis in 1500 cases of syphilis, and 23 cases in the same number of rheumatic patients.

BURNETT.

VAUGHAN (660) relates some cases in which he considers that malaria played a part in the production of the eye symptoms. In one case there was a fluctuation in the visual acuteness having quite a periodic character. This disappeared on administration of quinine. In another case there was a marked ptosis of one eye, associated with congestion of conjunctiva and diminished visual acuteness. These also disappeared on the administration of quinine.

BURNETT.

ARCHIVES OF OPHTHALMOLOGY.

THE OPHTHALMIC HISTORY OF AN ENGLISH SCHOOL (A.D. 1856 TO 1900).

By SYDNEY STEPHENSON,

OPHTHALMIC SURGEON TO THE EVELINA HOSPITAL, LONDON; OPHTHALMIC SURGEON TO THE NORTH-EASTERN HOSPITAL FOR CHILDREN, LONDON; OPHTHALMIC SURGEON TO QUEEN CHARLOTTE'S HOSPITAL, MARYLEBONE, LONDON; ETC., ETC., ETC.

THE Central London District School, at Hanwell, is one among a dozen or so "District Schools." It receives children, between the ages of three and sixteen years, who have become a charge upon the poor rates. Its inmates are now drawn either from the City of London or from St. Saviour's, Southwark, although formerly they came also from other districts of London. It is governed by a board of management, the members of which, for the most part, are also guardians of the poor for the constituent unions. It is under the ultimate control of a department of State, the Local Government Board, whose inspectors visit the school from time to time.

The School District was instituted in the year 1849, and the premises were located at Westow Hill, Norwood, near London. The buildings, however, were before very long found inadequate, so that in 1856 the Hanwell site of one hundred acres was bought for £12,600, and a new school, officially certified for 1200 inmates, erected there, at a cost of £45,200.

The Hanwell School has had a chequered and instructive career as regards ophthalmia. The ailment appears to have been brought with the children from the original school at Norwood. It was continually increased by fresh cases from the London workhouses whence the inmates were drawn. Report after report, bearing upon outbreaks of ophthalmia,

may be found by anybody who is interested in the matter. Mr. William Bowman, in May, 1858, examined four hundred of the children belonging to the City of London, who were at that time inmates of the school, but merely discovered some eight or ten with catarrhal ophthalmia. He pointed out that it was probable that an equal number of cases of a similar kind would be found under similar circumstances amongst children of the poorest class, wherever congregated, at that season of the year. He reported that those affected were under suitable treatment, and that "none were so ill as to require to be kept from their classes." Mr. Bowman, in the course of his remarks, expressed his unqualified approbation of the dietary and of the general appearance of the children, but suggested that a higher scale of wages should be paid to the nurses in the infirmary and elsewhere. Three years later (1861), the school was inspected by Mr. Haynes Walton, who noted the existence of nearly two hundred cases of the same malady, which he thought was not contagious and attributed to "excessive ventilation." Mr. Walton's curious conclusion was fairly met by the board of management in a report dated November 6, 1861, an extract from which reads as under: "The managers cannot agree that the disease of weak or sore eyes is in any great degree to be attributed to the ventilation complained of, for the disease prevailed most in the summer, and then was existing almost entirely among the boys, although both boys and girls were subject to the same mode of ventilation."

In 1862 the ophthalmic state of the Hanwell School was, according to contemporary evidence, simply disgraceful. Before expert advice was sought, many eyes had been destroyed by ophthalmia of so virulent and painful a nature that streams of water were kept playing upon the inflamed eyes, in order to reduce inflammation and mitigate suffering. The patients were not isolated, and (so it is stated) used to wash their eyes in pails of lotion, using their hands for the purpose. Swarms of flies, attracted by the abundant discharge, tormented the children. Mr. Bowman was again called in, and this time found no less than 686 cases. Several of the younger lads—who, as a class, suffered more

severely than the other children — were stated to have lost one or both eyes from the ravages of the disease. In order to cope with the outbreak, five outside doctors were engaged to assist the resident medical officer, and some of the nurses and medical attendants contracted the disease themselves. During the course of that eventful year, Mr. Bowman visited the school at intervals, and made in all ten reports, the first of which was dated March 28, and the last July 4, 1862.

The advice of Mr. George Critchett was sought in August, 1868. That gentleman made a suggestion that was not fully carried into effect until twenty-two years later, namely, that children in the infirmary should be treated in much the same way as if they were in the school itself. Mr. Critchett explained the advantages of his proposal in the following words: "1st, the education of the children would not, as now, be neglected; 2ndly, there would be no necessity for hurrying convalescent children back to the school, with the double risk of relapse and of contaminating others; 3rdly, the infirmary would cease to be, as it now is, *an attractive place* to the children, full of toys and idleness, and pleasant walks and good diet; 4thly, this would render the artificial generation of the disease by the children themselves, in order to get away from school to a more agreeable abode, far less common than it is now; 5thly, it would preserve the school from the intrusion of infected cases that inoculate others, and thus keep up the numbers of fresh cases." The attitude of the management of the school can be readily gathered from the report of a special committee, dated 30th January, 1869, an extract from which reads: "The liability to a recurrence of the disease has induced one eminent oculist to suggest that during the lengthened detention of the infirmary children from school they should be provided with separate scholastic tuition. Your committee are fearful that such a system would entail an enormous expense and a great disarrangement of discipline, and they are very doubtful whether, if it were possible to put it in force, the results would be sufficiently favorable to justify the outlay and inconvenience. They, therefore, cannot recommend the suggestion to be adopted."

Ophthalmia, as might be expected, remained a standing curse to the school. In the year 1874 Mr. Edward Nettleship made an ophthalmic inspection of the metropolitan poor-law schools. Hanwell occupied a prominent place on his black list, for no less than 44.1 % of its inmates were found to be suffering from "bad granular lids." He pointed out that the infants' department was very defective, and stigmatized the existing system of administration "as an arrangement for favoring the production and spread of the disease, and then keeping it in check by unceasing, laborious, and expensive medical treatment."

The Local Government Board then took the matter in hand, and in 1875 strongly urged several remedial measures upon the governing body of the institution. They advised (1) the removal of the worst cases of ophthalmia to a distinct building upon a separate site; (2) the erection of a school for infants, where those children could be properly subdivided and looked after; and (3) the remodelling of the sanitary state of the school buildings and the surroundings of the children generally. According to Dr. J. H. Bridges (then Local Government Board Inspector), "the response to this advice was of a very imperfect kind. The managers declined to erect a separate infants' school. Instead of removing the affected children to another site, and placing them under the care of a medical man devoting his whole time to the work, all that was done was to erect iron huts for 100 beds, and to set aside four dormitories in the school for the remaining cases. A few improvements of a minor kind were made in sanitary conditions and in out-door exercise."

Matters remained in this unsatisfactory state until May, 1888, when a report issued by the resident medical officer, Dr. S. G. Litteljohn, disclosed in truth a startling state of affairs. A study of its pages showed that since the iron huts were put up in October, 1875, as many as 2,649 children had been placed in them on account of ophthalmia. During the same period, 531 cases were received from the workhouses and infirmaries of the constituent unions, so that 2,118 of the cases pre-existed in the school. On particular occasions,

the number of children isolated for ophthalmia had ranged from 76, on July 5, 1884, to 203, on November 2, 1885. "Hundreds of eyes admitted healthy," Dr. Litteljohn said, "have been attacked here, and it is useless, and would be cowardly, to attempt to deny or conceal it."

Soon after the issue of this incriminatory document, Mr. E. Nettleship was again asked to examine the Hanwell School. From his report (December 13, 1888) it seems that there were about 375 children affected with ophthalmia. He laid down the dictum (from which no experienced person could reasonably dissent) that "ophthalmia is the touchstone of the general healthiness of an institution," and repeated the advice already tendered by the Local Government Board, namely, the erection of an isolation school, either at Hanwell or elsewhere. The managers, however, wavered and did nothing. The public press then took up what it did not hesitate to describe as a scandal. One of the great London newspapers put the plain issues before its subscribers, and concluded a just though pungent article with these words: "Proper steps must be at once taken, irrespective of cost, and the managers must not be allowed any longer to evade their responsibility." The medical journals spoke in much the same way. These public denunciations were not without their effect. Mr. Mundella thought it his duty to bring the facts under the notice of the House of Commons (May 10, 1889). This unenviable publicity appears to have aroused the school management to activity, as shortly afterward I was requested to visit the school and report upon the whole matter. It was thought that the cases could be isolated in a portion of the school itself, but, after inspecting the premises, I advised strongly against any such attempt. I urged that the affected children should be placed in a distinct establishment at Hanwell or in one of the other London suburbs. Meanwhile, public interest remained focussed upon the institution. On June 18, 1889, the Earl of Strafford, in the House of Lords, drew attention to ophthalmia at Hanwell, and asked what steps had been taken to remedy the evil. Eventually, my services were retained; a large staff of nurses was engaged; and the

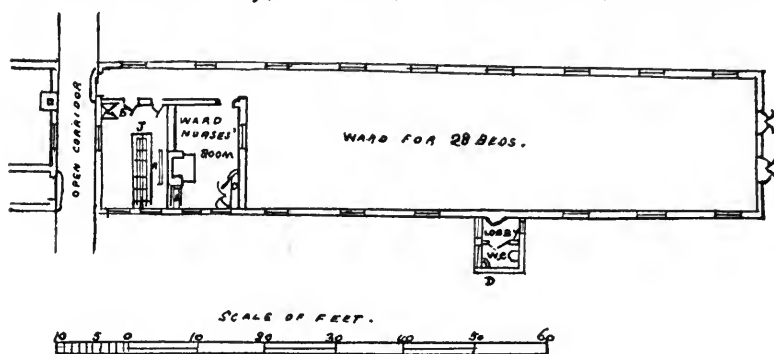
construction of buildings for four hundred patients on ground adjacent to the school was decided on. These wards were begun on September 1, 1889, and every affected child was placed in them by the following May, the cases having meanwhile been isolated as well as possible in several portions of the Hanwell School. The managers, now fairly roused to vigorous action, did not permit matters to rest there. They determined, under expert advice, to reconstruct the drainage of the school; to effect several much-needed improvements in the arrangements for washing and bathing; to erect a separate infants' school¹; and finally, as far as might be, to remodel the school buildings. With regard to the last point it should be explained that the Hanwell School was at that time arranged upon the "barrack" system — that is to say, a majority (92 per cent.) of its inmates were housed under a common roof. The main building, of three stories, had an unbroken frontage to the north of six hundred feet, and was planned upon lines popular at the period when it was erected — the "corridor" system. In other words, the sleeping rooms ventilated into central enclosed corridors, the air in which could never be effectually changed. Three large attic dormitories formed, as it were, a fourth story to certain parts of the main school frontage. Each of those apartments held about one hundred beds, but anything like adequate ventilation was out of the question in such immense rooms. The school-rooms projected southward at right angles to either end of the main building. In the centre were kitchens, dining-hall, and laundry, separating the playing yards of the boys from those of the girls. Immediately behind the laundry lay the school infirmary, a building of several stories, arranged around three sides of a square. These various buildings covered the space of about four acres, but most of the children were lodged in the front block, equalling about two-thirds of an acre. As Dr. Bridges remarked, in the course of an official report, "There is no other instance of so large an accumulation of children in a building constructed on the corridor principle."

¹ The managers, on October 29, 1890, decided that the further consideration of the infants' school should be deferred pending the completion of the works then in progress.

All this was changed in the year 1890, when four open spaces, running from north to south, were driven through the main frontage of the school, and, in addition, the outstanding wings of the square figure were separated from the frontage. A glance at the appended plan will show the exact manner in which this sweeping change was effected. The size of the dormitories was reduced, and their ventilation, warming, and lighting improved. The ends of the short corridors were left freely open, and a proper circulation of air was in that way assured. This work, which cost £14,684, was commenced on July 15, 1890, and completed on February 19, 1892. Its chief result was to convert a "barrack" school into one made up of a number of detached blocks, exposed on all sides to the atmosphere. In the following year (1891) a detached school-house, for the education of the elder children, was erected in a field at a distance of 160 feet south of the boys' playing yard. The building (which is indicated on the block-plan) cost about £14,000. It contains fifteen class-rooms, all of which are well lighted, warmed, and ventilated. Dual desks, of a good modern type, were provided. A swimming bath, of large size, used by both sexes, was also put up at about this time behind the school infirmary, not far from the school-house.

A few words of description must be devoted to the *special hospital for ophthalmic patients*, which, as already stated, was ready for occupancy by May, 1890. As shown by the block-plan (17), it is arranged on the pavilion system, and stands upon a piece of ground, some eleven acres in extent, adjacent to the Hanwell School, from which it is separated by a stout oaken fence. Its cost amounted to about £30,000. Its buildings are one-storied, constructed of corrugated iron and wood with layers of felt between, and are raised from the ground by brick piers; they are separated from one another, so as to facilitate classification of cases. There are twelve large and three small wards. Each of the former (as will be seen from the appended sketch) has attached to it (a) baths and washing jets, arranged upon the spray system; (b) sanitary conveniences; and (c) nurse's room. The smaller wards have also (d) a room for recreation connected

with the ward by a gangway freely open to the air at the sides. The dormitories contain from 12 to 28 beds apiece; the mean floor-space per bed is 53.35 square feet and the cubic space 640.20 cubic feet. Ventilation is carried out by opposite, external, double-hung sash windows, fanlights, floor inlets, and ridge exits. The wards, which have polished flooring-boards, are warmed with hot-water pipes. The Ophthalmic School includes rooms for school-work and for play, dining-halls, kitchen, stores, apartments for nurses and servants, etc. At present its nursing staff numbers fifteen: that is to say, a matron, two staff nurses, and thirteen



probationer nurses. The educational staff comprises two male certificated tutors for the boys and five female certificated teachers for the girls and younger children. 91% to 96% of the patients, on the average, are capable of attending school. The hours of instruction range from 23 to 24½ a week. The place is certified by the Local Government Board for 330 beds. Its population is quite cut off from that of the Hanwell School, although the two places are not far from one another. Indeed, the connection between the institutions is limited to few points, none of which concern the children, but which have to do with administrative details, such as supervision, disinfection, stores, and laundry. The Ophthalmic School is under the control of a committee chosen from amongst the managers of the Central London District School.

While these various improvements were being made, the Hanwell School was placed under strict ophthalmic

supervision. For example, frequent inspections were conducted of the children's eyes, for the purpose of weeding out disease without loss of time; officials were encouraged to notify at once the least discharge from, or redness of, the eyes; careful attention was paid to the arrangements for personal washing, bathing, and drying, as well as to other matters likely to be concerned in the spread of ophthalmia. It should be explained that newcomers from the London workhouses on arrival at Hanwell are placed in a detached building (shown on the plan) for thirteen days, so as to keep them apart from the ordinary inhabitants of the school. When admitted, their eyes were examined by me for any trace of trachoma, and the results were officially recorded. Diseased children were rejected by virtue of an order of the Local Government Board (1889) under which no child suffering from "any affection of the scalp, or of the skin, or of the eyes" shall be received at a district school, such as Hanwell. Such cases were therefore thrown back upon the hands of the London unions, which were forced to find accommodation for the cases as best they could. The intolerable situation thus created was eventually got over in a way that will receive mention further on. In short, it will be perceived that the plan of campaign against ophthalmia included: (1) exclusion of the disease by rejection of infected newcomers; (2) isolation in a suitable building of any of the inmates of the school who showed signs of the disorder; (3) a system of notification by nurses and attendants; (4) frequent medical inspection of the children's eyes; and (5) the securing for the inmates the inestimable advantages of good sanitary and domestic surroundings.

The radical measures thus enforced soon produced an appreciable change in the order of things. Admissions of diseased children, naturally heavy at first, began to diminish, and, with exceptions in 1895-1896 and 1899-1900 (which will receive full attention later) at length fell to a low point. The following table shows the number of children passed yearly from the Hanwell main school into the Ophthalmic isolation school, distinguishing between those (a) with definite ophthalmia and (b) with other eye ailments:

	Total	Ophthalmia	Other eye ailments
1889-90.....	186	186	—
1890-91.....	65	35	30
1891-92.....	34	15	19
1892-93.....	35	13	22
1893-94.....	34	9	25
1894-95.....	14	4	10
1895-96.....	50	29	21
1896-97.....	17	5	12
1897-98.....	3	1 ¹	2
1898-99.....	1	1	—
1899-1900.....	22	19	3

Those who have perused the earlier pages of this paper will remember that from 1875 to 1888 the Hanwell School produced no less than 169 cases of ophthalmia annually. During that term, according to official records, the smallest number isolated at any one time for ophthalmia was 78, on July 5, 1884.

When I began work at the school, on June 10, 1889, I found 206 cases in the ophthalmia wards, and, during the course of the next few months, 186 other cases, until then loose in the school, were added to the number. From June, 1889, to May, 1890, 19.25 % to 34.15 % of the total population of the Hanwell School suffered from ophthalmia. Now mark the difference brought about in a few short years by the unflinching application of common-sense measures. On June 9, 1894, the Ophthalmic School contained forty-five children from the Hanwell School. On December 9, 1896, it included five children only from that source — or 0.6 % of the population of the latter place. On November 1, 1898, it counted not a single case from the main school. From that date onwards until May 8, 1899, not one of its inmates had come from the big school. The record was then broken by the admission of a lad whose trachoma had relapsed after dismissal from the hospital. At the moment of writing (March, 1900), the same boy remains under treatment, but he is the sole representative of the Hanwell School. Could any statement show more clearly that trachoma may be extirpated from an institution whose very name had been on that account a standing reproach to the annals of English poor-law administration ?

¹ Recurrence: formerly in Ophthalmic School.

As might have been expected, owing to the discharge of cured cases, the number of patients in the Ophthalmic School lessened steadily from month to month. For example, after a year's work, it fell to 227. On February 6, 1892, it stood at 186; on June 11th, in the same year, at 101. On the latter date, eight only out of the fifteen available wards were occupied; the nursing staff had been reduced from 22 to 9 nurses; similar economies were practised in other directions. This steady decrease had taken place despite the fact that the Local Government Board had allowed the constituent union of St. Saviour's to send its eye cases direct to the Ophthalmic School. Such cases, rejected for ophthalmia at Hanwell, had accumulated in the London workhouses and infirmaries, where they entailed a risk of infecting other children, caused great administrative inconvenience, and showed little tendency to get better. In brief, their detention spelt accumulation, and that implied serious interference with the proper functions of a workhouse or poor-law infirmary. From November 17, 1890, when the plan first came into operation, scarcely a month elapsed without a fresh importation of affected children from St. Saviour's Union. To what an extent this went on will be evident from the following figures, which deal with the five years, 1890 to 1894, inclusive:

<i>Year.</i>	<i>Cases.</i>
1890.....	32
1891.....	50
1892.....	41
1893.....	84
1894.....	62

In June, 1893, the Ophthalmic School entered upon a new phase of its existence. At that time the managers agreed to receive cases of ophthalmia from outside unions, parishes, and school districts, in many of which the malady was known or suspected to be rife. They contracted to board, lodge, clothe, educate, and provide with medical treatment such cases at an inclusive charge of 12s a week per child. There was almost from the first no dearth of applicants. The beds at the Ophthalmic School have never gone a-begging. Readers can form some idea of the extent of the work

thus carried on from the bald statement that since 1893 no less than 2,356 cases from thirty-two of the unions have passed through its wards. Admissions average about three hundred a year. Two-thirds to three-fourths of the patients suffer from trachoma. It will thus be perceived that the work of the Ophthalmic School, at first confined to receiving cases from the Hanwell School, has been widened and extended so as to admit children from many other sources. In fact, the institution has become a central hospital for the reception of patients from most of the London workhouses, infirmaries, and poor-law schools. Before leaving this part of the subject, it should be mentioned that in 1897 the Local Government Board threw the duty of looking after ophthalmia cases upon the Metropolitan Asylums Board, a central body charged chiefly with the cure of fever patients. Sites have been obtained and plans prepared for the erection of two ophthalmic schools, one at Brentwood and the other at Swanley. On the completion of those buildings, ophthalmia cases will pass to the Asylums Board, and the Hanwell Ophthalmic School will presumably be put to other uses.

It has been said, probably with more than the proverbial grain of truth, that the virulence of certain diseases increases according to the aggregation of cases. There can be no doubt that ophthalmia becomes more malignant when the eternal laws of sanitary science are violated. The entire history of the Hanwell School bears out this view. Earlier pages have shown what happened there in the period 1856-1889. From June 10, 1889, to May 16, 1890, cases of ophthalmia were isolated in portions of the big school, unsuitable alike from the construction and arrangement of the sleeping wards and the absence of proper means for education, for catering, and for recreation. Overcrowding, in the ordinary sense of the word, certainly did not exist, since about fifty feet of floor-space was given to every bed. But this fairly liberal allowance was to a great extent neutralized by the large size and imperfect ventilation of the rooms, into some of which the sunlight never penetrated. The girls' school-room lay beneath the ground-level; it was never even

tolerably ventilated, and was used at odd times for meals. The washing arrangements were quite inadequate: sixty children, for instance, were allowed one small lavatory. Our experiences during those eleven months were simply heart-breaking. Four out of the twenty-one nurses contracted trachoma. Relapses¹ occurred in large numbers: thus, among 134 children there were 248 relapses. Patients admitted for mild ophthalmia contracted severer forms, which was not surprising, since the large size of the wards rendered any attempt to keep together sufferers from any given kind of ophthalmia well-nigh hopeless. The detached, cross-ventilated, and bright wards of the new Ophthalmic School soon altered all that. Notwithstanding the large numbers of persons (nurses, teachers, servants, etc.) employed there since 1890, not one of them has contracted any form of ophthalmia. Moreover, relapses among patients have become uncommon, as shown by the subjoined figures:

1890-91.....	49	relapses among 42 children.			
1891-92.....	25	"	"	25	"
1892-93.....	8	"	"	6	"
1893-94.....	14	"	"	12	"

In short, a greater number of relapses occurred in eleven months under the old *régime* than in four years under the new. The communication of trachoma from one patient to another is a very rare event. In fact, it has been observed only in the ringworm ward, where all kinds of eye cases must of necessity be grouped for sleeping purposes. We may conclude, therefore, that the intensity of ophthalmia bears a relationship, not to the numbers collected together for treatment, but rather to the nature of the hygienic surroundings, whether good or bad.

In this connection I may be allowed to express my conviction, founded upon something stronger than mere surmise, that relapses in trachoma patients are to some extent connected with meteorological conditions. Three hundred and thirty-three such cases were examined statistically,

¹ By the word "relapse" is meant an attack of more or less acute conjunctivitis in patients already isolated and under medical treatment.

especially with regard to (*a*) direction of wind, (*b*) velocity of wind, and (*c*) amount of moisture in the air. The exact facts have already been published, so that I will merely record the conclusions reached as the result of the inquiry:

1. It seems clear that the agent or agents giving rise to relapses come into play some days before the relapse is actually observed.

2. Barometric variations appear to exert no appreciable influence in the production of relapses.

3. Since 62.76 per cent. of the relapses were preceded by wind, the velocity of which exceeded the average of the previous sixteen years, it is impossible to avoid the conclusion that winds of excessive velocity exert a material influence.

4. Humidity of atmosphere above a certain average would appear to stand in a causal relationship to relapses. It is significant to find that 72.07 per cent. of all the relapses were preceded by increased humidity of the air on one or more of the three days immediately preceding the relapses.

5. There appeared to be no connection between the occurrence of relapses, on the one hand, and the direction of the wind, on the other.

The even course of events as regards ophthalmia in the Hanwell School since the improvements of 1890 has been broken on two occasions, namely, in 1896 and in 1899, when outbreaks of the disorder made their unwelcome appearance.

The facts of each epidemic are so instructive that no apology need be offered for recounting them briefly.

FIRST OUTBREAK, APRIL, 1896.

On April 12, 1896, two infant children were observed to present some discharge in the corners of their eyes. For the time being they were placed in bed in the school infirmary. The cases belonged to D block (see plan), where they occupied No. 6 ward. On the following morning (April 13th) they were seen by me, and Koch-Weeks' bacilli having been found in the eye discharges, they were sent away to the Ophthalmic School. The other children who belonged to the same dormitory were at once examined, and three, who were discovered to have discharge from the eyes, were sent

to the Ophthalmic School. A fourth child from another part of the building (10 on plan) was observed to present muco-purulent secretion from his eyes, and on that account he was isolated. On inquiry it was discovered that a couple of days previously this latter child had gone with a message to the infected dormitory in D block. Furthermore, he had access to a playing yard and day-room in common with the inmates of that block, so that two distinct exposures to infection were at once revealed.

The ailment having declared itself so definitely among a particular group of the inmates, it was thought advisable to quarantine those not yet affected. In short, the inhabitants of No. 6 dormitory were not allowed to come into any sort of contact with the rest of the school. The attendants were warned to notify me immediately if the least sign of discharge was noticed in an eye. The children were examined by me twice a day. Instructions were given that bedding, towels, etc., of any infected child should be sent to the steam disinfecter, and that his bedstead should be scrubbed with a strong solution of carbolic lotion. A special observation ward was prepared in the Ophthalmic School, so that any suspicious case might be sent to it without an instant's delay.

It is most instructive to trace the further course of the epidemic. On April 15th three and on April 16th six more cases were detected among the children in No. 6 ward. On the latter day another lad was removed from the school infirmary to which he had been sent from No. 6 ward about twenty-four hours before on account of some slight indisposition. On April 17th three and on April 18th two other cases were removed from No. 6. On April 19th the only two infants remaining in that ward were attacked. In fact, ophthalmia had made a clean sweep of the infants in No. 6 dormitory, for the only inmates remaining unaffected were two of the elder girls who helped in the domestic work. Moreover, one lad from another part of the building had been attacked. The total thus far was twenty-three. On April 19th, a suspicious case was detected among the children who occupied a dormitory on the same floor as No. 6,

and this was followed by a second case on the 20th. At the time of these occurrences, this second ward contained thirty inmates—that is to say, twenty-eight infants and two ward girls. Fearing that ophthalmia might spread among the population of this dormitory as it had amongst that of No. 6, the whole of the inmates, together with their beds and bedding, were sent to a detached building (12 on plan) that lay upwards of one hundred yards from the main school, and were there quarantined. The two ward girls accompanied them, as did the two who had remained unaffected in No. 6 ward. Judged in the light of subsequent events, this step had a happy result. The children were kept apart from April 20th to April 30th, yet during those ten days no fresh cases arose.

Summary.—Between April 12th and April 25th twenty-five children became affected with acute muco-purulent ophthalmia; of that number twenty-two were derived, directly or indirectly, from a single ward, and the other three from wards more or less closely connected with it. The ages of the patients ranged from three to seven years; all save one belonged to the male sex. Koch-Weeks' bacilli were present in every case, alone in eighteen patients, and associated in seven cases with cocci and diplococci (3), xerosis bacilli (3), and with large unidentified bacilli (1). Some of the cases were mild and others were severe examples of acute muco-purulent ophthalmia, but no child sustained the least damage to the cornea, nor did any serious sequel, such as trachoma, follow in a single instance. It is noteworthy that many of the sufferers developed a coincident "cold in the head"; that conjunctival phlyctenulæ existed in nine cases; and that sub-conjunctival hemorrhages formed characteristic features of the severer cases. By May 27th twelve of the children had been dismissed, while all save two had left the Ophthalmic School by July 7, 1896. The other two cases were respectively dismissed on September 5th and November 7th, their discharge having been delayed for reasons connected but remotely with ophthalmia.

SECOND OUTBREAK, DECEMBER, 1899.

On December 9, 1899, a little girl belonging to D block was brought to me, as she had some discharge from the eyes. The inmates of that block, whom I had seen two days before, were at once examined, and five of them were found to have some little running from the eyes. These five cases, together with the child just mentioned, were sent to the Ophthalmic School, where an isolation ward had in the meantime been got ready for them. On the following day (December 10th) twelve more cases were taken from D block. Steps were then adopted in the hopes of delimiting the outbreak. Thus, the inhabitants of D block were kept apart from all other children, as regards their sleeping, playing, washing, bathing, and eating arrangements; schooling was abandoned, and they were made to spend a great part of each day in the open air. On December 11th, three other cases were remitted to the Ophthalmic School, but not a single case made its appearance after that date. The children, nevertheless, were inspected daily and quarantined strictly until December 23d, when they were allowed to mingle with the ordinary population under the usual bi-weekly inspections.

Summary.—During three days, twenty-one children were isolated on account of ophthalmia. The malady was marked by slight — nay almost trivial — signs. Most of the cases showed nothing beyond a little discharge of watery mucus from the eyes, along with redness of the palpebral conjunctiva, caruncle, and semilunar fold. The ocular conjunctiva was seldom appreciably involved. The treatment offered no especial difficulty and calls for no particular comment. The last child had left the Ophthalmic School by February 6, 1900.

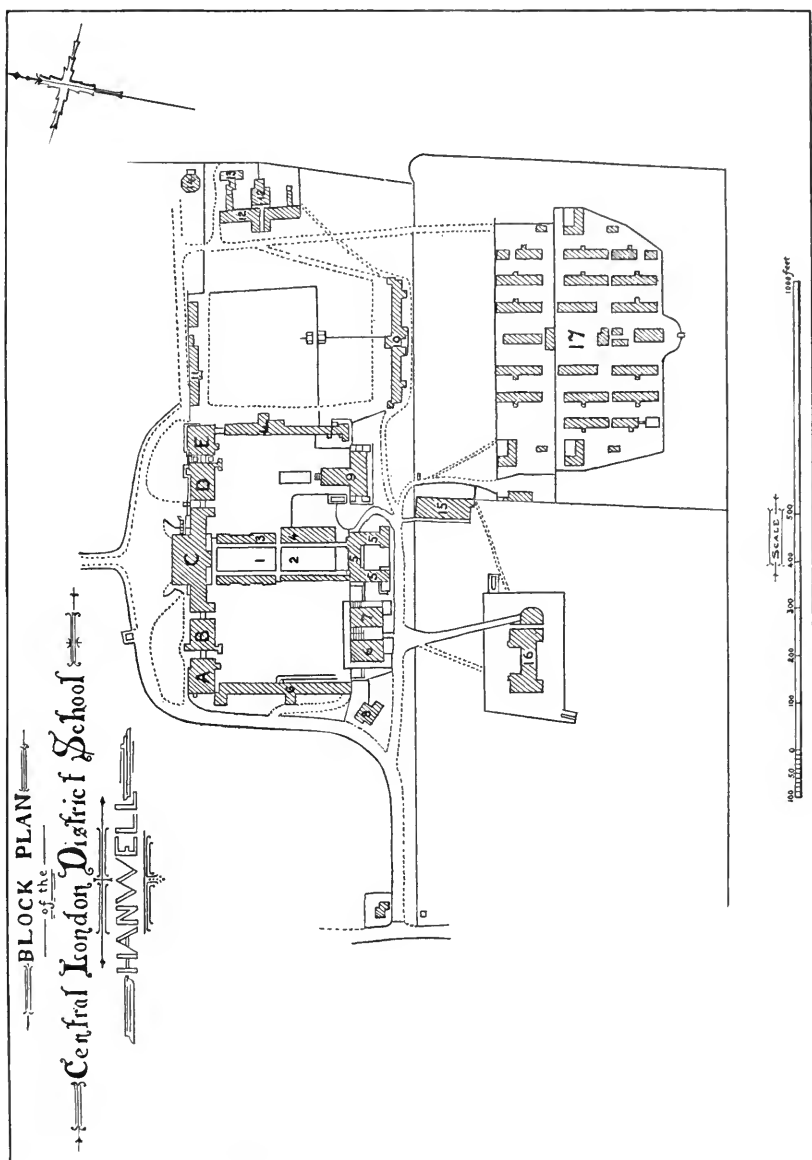
Every case was investigated bacteriologically with the results set forth below:

With regard to those cases, eleven in number, in which diplo-bacilli were found, the following points seem to deserve mention: (1) the number of the organisms appeared to be directly proportionate to the severity of the symptoms; (2) the diplo-bacilli varied greatly in size; (3) they lay free

in the intercellular fluid and showed no tendency to general intercellular lodgment, although occurring in clumps in and about the epithelial cells of the specimens.

No.	Name.	Age.	BACTERIOLOGICAL EXAMINATION.	
			Cover-Glass Preparations.	Cultures.
1	Clarke, Alice	5	Xerosis bacilli	Xerosis bacilli
2	Nuckley, Elizabeth	3	Cocci and diplococci	{ Pneumococci
				{ Xerosis bacilli
3	Greaves, Jane	5	Diplo-bacilli	{ Pneumococci
				{ Diplo-bacilli
				{ Xerosis bacilli
4	Nash, Maud	9	Diplo-bacilli	—
5	Newton, Winifred	3	Diplo-bacilli	—
6	Sycamore, Beatrice	4	Diplo-bacilli	—
7	Harding, Minnie	6	Cocci and diplococci	Pneumococci
8	Walker, Edith	5	{ Diplo-bacilli	{ Diplo-bacilli
			{ Cocci and diplococci	{ Pneumococci
9	Stone, Ada	6	Negative	—
10	Buckle, Ethel	6	Negative	—
11	Rider, Ida	6	Diplo-bacilli	Diplo-bacilli
12	Yates, Ethel	4	Diplo-bacilli	—
13	Rice, Hannah	5	Cocci and diplococci	Pneumococci
14	Leathart, Dorothy	3	Cocci and diplococci	Pneumococci
15	Word, Elizabeth	7	Diplo-bacilli	—
16	Parsons, Margaret	6	{ Diplo-bacilli	{ Diplo-bacilli
			{ Cocci and diplococci	{ Pneumococci
17	Eade, Ada	7	Cocci, diplococci, and chains	Pneumococci
18	Collier, Lydia	6	Cocci, chains, long and short	{ Streptococci long.
				{ Pneumococci
				{ Micrococci tetragon
19	Wilcox, Lilian	6	Cocci, diplococci, and short chains	Pneumococci
20	Elliott, Maud	3	Diplo-bacilli	Diplo-bacilli
21	Emery, Lizzie	6	Diplo-bacilli	Diplo-bacilli

Cause.—For several weeks before the outbreak, St. Saviour's Union had been sending to the Ophthalmic School patients suffering from mild diplo-bacillary ophthalmia. For example, of eighteen cases received there between September 22 and December 1, 1899, no less than 61 % were thus affected. At about the same period, several of the newcomers from that union to the probation wards at the Hanwell School were found, upon examination, to be similarly affected. This can scarcely be wondered at, seeing that the children sent to the Ophthalmic School and to the



EXPLANATION OF PLAN.

A, B, D, E, and F are the blocks devoted to the sleeping accommodation of the children. They contain, all told, 692 beds. C is the central or administrative block. 1, 2, 3, 4.—Dining-hall, kitchen, and laundry buildings. 5.—The school infirmary, containing 7 wards and 3 day-rooms. 6.—Gymnasium. 7.—Boys' playing-room. 8.—Medical officer's residence. 9.—Girls' and infants' playing-room. 10.—Iron buildings originally erected in 1874 for ophthalmic purposes, but now containing 100 beds for the younger lads. 11.—Spare dormitory erected in 1874 as a playing-room for ophthalmic patients. 12.—A two-storied building, the lower part of which is used as a probation-house and the upper part for purposes of isolation. 13.—A small laundry with Washington-Lyon's steam disinfecter. 14.—Band-room. 15.—Swimming-bath. 16.—School-house for boys and girls. 17.—The ophthalmic school.

big school would be derived from the London workhouse, where it would be a difficult matter to group the children according to the state of their eyes. Besides, the signs of the disorder were by no means always well marked, and their significance might readily escape attention in the absence of a bacteriological examination. It is likely that the epidemic in D block (which involved three out of the four dormitories) was due to slight cases creeping unrecognized through the probation wards into the school. It should be added that since this outbreak the probationary term has been raised from thirteen to twenty days.

A brief survey of the main facts of the case will convince the candid reader that something might yet be done to improve the accommodation provided at Hanwell for infants. Their present block was made in 1890-1892, by the cutting-up of the main building into sections. The block faces the fields on the north and the girls' playing yard on the south aspect. It lies, as will be seen from the plan, between two other blocks, one of which (E) is devoted to girls and the other (C) to official purposes. The infants' block, thus placed, consists of three stories, and includes beds for 112 of the children below seven or eight years of age, the so-called "infants." It is separated from the adjoining blocks by an air-space of about seventeen feet, bridged by light iron passage-ways upon the second and third floors. The ground-floor is divided by a corridor (70 ft. 6 in. by 11 ft.), open at both ends, into two main apartments—that on the north side is a dormitory (67 ft. by 18 ft. 9 in.), containing thirty-one beds for the elder girls; that on the south side is a combined dining- and recreation-room for the infants, opening directly into the girls' playing yard. The ground-floor also includes a dentist's surgery, as well as a store-room for dresses, hats, cloaks, etc. The result of this arrangement is that, under ordinary conditions, girls and infants mingle freely in corridor, in playroom, and in airing yard. In times of quarantine, its drawbacks are infinitely greater. The infants have no separate play-ground and their living-room is divided from the girls' dormitory by the width of the corridor merely, thereby increasing the difficulties of preventive

isolation. The furniture, arrangement, and size (55 ft. 2 in. by 18 ft. 10 in.) of the day-room precludes more than one-half of the infants dining in it at one time, a deficiency which is met by the simple expedient of sending the over-plus to the general dining-hall for all their meals. In time of quarantine, the infants must perforce dine in two batches, while great inconvenience is caused by the absence of a scullery in the vicinity. The two upper floors are arranged on the same general plan, and they also are not devoted exclusively to infants. Each floor includes: (a) two infants' dormitories, (b) a lavatory, and (c) a small bedroom for a few of the elder girls. (a) *The dormitories*: These measure 67 ft. by 18 ft. 9 in. and 55 ft. 7 in. by 19 ft. 4 in. respectively, and contain from twenty-five to thirty-one beds each—that is, more than double the number sanctioned by modern experience in any ward for young children. Dormitories with many beds clearly mean the exposure of a larger number of children to a common infection. This was strikingly shown in the 1896 epidemic, in which every infant inmate of No. 6 ward was attacked with ophthalmia. For the rest, the dormitories are well ventilated, and warmed and lighted properly; they have polished flooring-boards and water-closet accommodation. (b) *Lavatory*: The washing apparatus, which is designed upon the jet system, leaves little to be desired upon that score. It consists of a two-inch iron service pipe, provided with nine nozzles on each side, placed eighteen inches apart. It is fixed horizontally sixty-five inches above an earthenware waste-channel, bedded in cement-concrete. Hot and cold water are laid on. The floor of the lavatory is laid with red tiles, while its walls are lined to a height of five feet with glazed bricks. The size (19 ft. 5 in. by 10 ft. 2 in.) of the room, however, renders it impossible to wash more than a few children at a time. Furthermore, the use of a lavatory common to both the wards on the same floor must increase the risks of spreading disease. Bathing: Of the four infants' wards included in D block, the inmates of two are taken across the playing yard to be bathed in a bathroom belonging to the girls. From this arrangement it follows that they

cannot be bathed either early in the morning or late in the day, because at those times the apartment is otherwise engaged. Apart from such inconvenience, there is the obvious risk of conveying infection, especially ringworm and ophthalmia, from the infants to the elder children and *vice versa*. In the other two infants' wards, those upon the first floor, bathing goes on in four small, enamelled tin baths, carried into the rooms. This plan entails much labor, and might tend to the undesirable practice of bathing more than one child in the same water. (c) *Girls' bedrooms*: These rooms are two in number,—one on each floor,—and are devoted to three of the elder girls who are on the point of leaving the school. They measure 19 ft. 5 in. by 13 ft. Washing goes on at ordinary washstands and basins. *Summary*: In my opinion, the several undesirable points about the infants' block are: first, the dimensions of the sleeping-wards; secondly, the insufficient dining, play, and lavatory accommodation; thirdly, the character of the bathing arrangements; fourthly, the bringing together in the same block of girls and infants; and fifthly, the planning of the block, which renders difficult efficient quarantine in case of an epidemic. The greater danger, however, lies in the cropping up of unsuspected cases of infectious disorder, such as measles or ophthalmia, as under existing conditions children who have been exposed to the infection are permitted to mix freely with the general population in playground, dining-hall, and bathrooms. When the infants are quarantined, it follows from the complex nature of the ground-floor that a number of girls from an infected block must be either kept secluded away from school or else be drafted into dormitories thitherto free from the risks of that particular infection. It is needless to dwell upon the great difference as regards education between the younger and the older children: the interruption of school, which is of little moment to the one, is a matter of considerable importance to the other. Therefore, any system which does not provide for the separation of the two classes stands self-condemned, not only on medical but also on educational grounds.

It is singular that, during the ten and a half years I have

been connected with the Hanwell School, the only two outbreaks of ophthalmia should have affected almost exclusively the younger children living in D block. In my experience, these infants are much more prone than the elder children to contract infectious maladies, to which ophthalmia is no exception. Indeed, their personal habits and proclivities predispose in an extraordinary degree to the passage of contagion. It is a question whether the truest economy would not lie in lodging these susceptible infants in a new school put up somewhere on the present grounds, away from the existing blocks. Such a school would probably be designed on the "cottage" or "small block" plan, include small dormitories, and be capable, on an emergency, of being quarantined, in whole or in part. Such was the advice tendered officially to the managers in 1875 by Dr. Bridges, but amidst the crowd of other improvements the recommendation, unfortunately, has been lost sight of. The question, in my opinion, is bound to press for solution in the future, alike on ophthalmic and on other grounds. In the present year (1900) a new schoolhouse for the education of the infants, including a commodious hall and several classrooms, has been erected on a field to the south of the big school. The better accommodation of the infants as regards their domestic surroundings must surely follow.

CONCLUSION.

From the foregoing sketch, readers will gather that the history of the Hanwell School may be said, without exaggeration, to be unique in the annals of poor-law administration. The one great lesson that it enforces is that trachoma, no matter of what standing or severity, may be stamped out of existence by proper measures. In the face of such an experience as that here recorded, it is clear that the continuance of ophthalmia in any school whatever constitutes a standing reproach to its management, lay and medical. In the case of Hanwell, from time to time, as we have seen, some slight structural alterations were made and specialists consulted, but it cannot be truthfully said that the expert

recommendations thereby obtained were in any single instance fully carried out. For example, up to the year 1889 nothing but partial isolation was possible for ophthalmia cases. In other words, the school was never free from the presence of a number of trachoma patients, who were planted as so many centres of infection in the midst of the healthy population. At the same time, it must be borne in mind that the general environment of the children was not brought up to the level of modern requirements, owing to the fact that reforms were carried out in a piecemeal and niggardly fashion. In 1889 the wide publicity given to the prevalence of ophthalmia at Hanwell led to far-reaching structural and administrative alterations. The crowning point was the erection of the Ophthalmic Isolation School and the practical remodelling of the main school buildings. The lessening of the disease, which up to then had been gradual, was hastened by leaps and bounds, so that for some years past Hanwell has shown a clean slate as far as trachoma is concerned. This is a record of which the present managers of the school may justly be proud. The money they have spent has been required chiefly to compensate the sanitary shortcomings of former generations. They may be congratulated on having achieved great reforms in the teeth of enormous difficulties. When called upon to deal with the ever-present burden of an infectious and obstinate malady, they spared neither time, money, nor expense to overcome the evil. It is to be hoped that now their attention will be given towards remedying the weak spot in the present structural design, namely, the domestic surroundings of the younger children. In conclusion, it may be pointed out that the history of Hanwell shows how happily the teachings of preventive medicine may go hand in hand with the ordinary routine of school administration.

ON HEMORRHAGIC RETINITIS IN CONSEQUENCE
OF ENDARTERITIS PROLIFERANS, WITH MICRO-
SCOPIC EXAMINATION OF A CASE.

By DR. M. REIMAR, HIRSCHBERG,
FORMERLY FIRST ASSISTANT IN THE ZURICH CLINIC.

(*With 32 figures on Plates IX.-XII. of Vol. XXXVIII., German Edition.*)

Abridged Translation by Dr. WARD A. HOLDEN.

IT is twenty years since Michel examined microscopically a case of spontaneous thrombosis of the central vein and distinguished the clinical picture of this affection from that of the many others characterized by retinal hemorrhages, yet few other microscopical examinations have been made.

I had the opportunity to examine an eye in which the ophthalmoscopic picture led to the diagnosis "thrombosis of the central vein of the optic nerve" and, glaucoma supervening, enucleation was done. The microscopic examination, however, did not reveal the expected thrombus, but an endarteritis proliferans of the central artery of high degree.

Mrs. H., aged fifty-seven, a laboring woman, came to the Clinic July 2, 1896. The patient is of limited intelligence and little could be obtained in the way of previous history. For five or six weeks she had complained of an obscuration of vision in the left eye. She had previously had good sight.

The patient is thin. The heart and lungs are normal, the radial and temporal arteries are rigid, but no other pathological conditions were found elsewhere in the body. The urine contained neither albumen nor sugar.

Left Eye: The disc is reddened and blurred and surrounded

by numerous hemorrhages. There are a few small hemorrhages on the disc itself. The arteries are very narrow and almost imperceptible. The veins are dilated and in great part covered with hemorrhages. The entire fundus is studded with hemorrhages, most densely about the disc. In the neighborhood of the disc are large white patches with blurred outlines; in the macula a dense hemorrhage with a lighter centre. No changes can be observed in the vessels.

The vitreous is diffusely cloudy and pervaded with flocculent opacities of various sizes. The cornea and lens are normal. Tension normal. The right eye is normal. R V = $\frac{8}{8}$. L V = movements of the hand at a distance of 1 m.

July 16th.—The hemorrhages in the left eye have been absorbed to a considerable degree. The disc is sharply outlined, of normal color, and the veins are but slightly dilated. The white patches remain as before. In the macular region are many small hemorrhages still. V = fingers at 3 m. Patient discharged.

March 2, 1897.—Readmitted. Patient not seen since her discharge. For a month pain in the left eye and forehead, frequent disposition to vomit. General condition as before.

Right eye normal. Left eye: Dull-red glaucomatous injection of the ball. Cornea dull and diffusely cloudy below. Anterior chamber deep, containing blood to the height of 2 mm. Pupil wide, vertically oval; synechiæ at its lower margin. Iris hyperæmic with small hemorrhages. Media obscure. T + 2. Amaurosis.

No improvement following the use of eserine and the performance of an anterior sclerotomy, enucleation was done March 19th under ether. Considerable hemorrhage.

April 2d.—Normal healing. Patient discharged. Further history unknown.

The enucleated ball was put into a 4 % formol solution for a few days and then divided equatorially. The retina remained everywhere adherent to the choroid. Over the entire fundus are scattered round and flame-shaped hemorrhages of various sizes, decreasing in number anteriorly. The disc is greatly excavated. The vessels appear as grayish-white stripes.

The anterior segment showed no peculiarities.

The posterior segment with a stump of the optic nerve 5 mm long was imbedded in celloidin and, beginning with the nerve, serial sections were cut until the retina was reached, and all the sections were examined.

The posterior segment of the ball was then divided into an upper and a lower half which also were cut in serial sections.

The sections were stained for the most part with hæmalum-eosin and van Gieson's stain.

Both central vessels in their proximal portions presented normal relations, and were filled with blood. The lumen of the vein was fairly normal, while the wall of the artery was somewhat wrinkled. This wrinkling is a post-mortem change caused by contraction of the muscular and elastic fibres.

In the 18th section there is seen in the lumen of the central artery a thin free-lying tongue of fine fibrous tissue with a moderate number of nuclei. In section 19 this tongue appears thicker and is seen to be attached to the vessel wall by a broad base. In section 21 the mass is larger and fills the muscle ring except for a narrow cleft lined with endothelium (Fig. 1).

The adventitia and media are quite normal. The new-formed tissue lies within the wrinkled elastica. In its outer portions it consists of a loose fibrillar network, chiefly concentric in arrangement and containing few nuclei. Near the lumen the tissue becomes denser and more cellular. The narrow lumen is excentric. In sections 23-26 a lumen cannot be distinguished, but the lining endothelial cells are recognized. In section 27 the vessel is seen where it bends in the floor of the excavation of the disc. In section 31 the lumen is again perceptible. In 36 (Fig. 2) the lumen is more considerable, the new tissue projecting fungus-like into the obliquely cut artery which here contains elements of the blood.

This endarteritic proliferation, which appears to be an old process in the regressive stage, extends along the artery for about 1 mm. In 27-28 the superior papillary artery is given off. Just at its origin it presents some thickening of its walls, but beyond it is normal.

In 33 a completely obliterated branch arises from the artery (Fig. 3). There is a projection into the lumen, filled with endothelial cells, which passes over directly into a coarse fibrillar tissue arranged concentrically and containing few cells. The elastica is recognized with difficulty since the muscular sheath has undergone a fibrous degeneration and is scarcely distinguishable from the inner fibrous mass.

The central vein gives off some small twigs which branch and are lost in the optic nerve. The walls of the veins do not appear abnormal. One branch presents some interesting features. It

divides into two, one of which is normally lined with endothelium and has a thin connective-tissue wall. The wall of the other is thickened by the presence of concentrically arranged bundles of fibrillæ with few nuclei. The very small lumen is lined with endothelium. Both branches retain their characteristics to the last sections of the series (Fig. 9).

The optic nerve was completely atrophic, but its sheaths presented no changes.

In the last section (52) the choroid and retina have been cut flat. The central artery had already divided into three lower and two upper branches with normal walls and one completely obliterated upper branch. The central vein had divided into one upper and two lower branches with normal walls, and the two small vessels already mentioned, one of which was normal and the other greatly narrowed by thickening of its walls.

Only the retinal vessels of the lower segment of the eye were followed in serial sections.

The inferior nasal vein has a normal wall and a normal lumen which is mostly round or oval, and exhibits only here and there post-mortem collapse. The chief trunk remained normal in its farther course.

The inferior nasal artery is at first normal. There is some post-mortem contraction of the vessel wall. Farther out in places the coarse fibres of the muscular coat pass over into finer fibrillæ, the entire arterial wall appears more homogeneous, the elastica can hardly be recognized, so that with slight magnification it is hard to differentiate the intima and the media. At other places the arterial wall is normal.

In section 54 begins a meniscus-like thickening of the intima consisting of concentric finely fibrillary tissue, rich in nuclei (Fig. 5). The endothelium is normal. From this point on, the retina exhibits a varying and irregular thickening.

In section 97 a small vessel is given off which is cut longitudinally for some distance. The endothelium and the nuclei of the muscle fibres are clearly seen. The lumen is blocked with blood corpuscles, and the polyhedral form of the red corpuscles, due to pressure, indicates that there had been stasis here in life. The relations remain the same up to section 100. From section 100 to section 103 the lumen is blocked with corpuscles and the vessel is surrounded by a hemorrhage limited outwardly by the adventitial sheath.

In 111 and the sections immediately before and after there is a round-celled infiltration of the adventitia and the neighboring retina, but only on the side toward the vitreous. In this region an obliterated venous twig crosses the artery.

The inferior medial artery is at first normal, but like the inferior nasal artery, farther along from place to place its wall becomes finely fibrillar. At section 50 the intima becomes thickened with a cellular tissue, which in section 70 is so excessively developed that only a very small lumen remains. In 71, 72, and 73 there are apparently two small lumina in the cell mass, but the endothelial lining is not distinct, and it is not unlikely that there was here a cleft-like lumen whose walls became adherent to each other in their middle portion. In sections 76 and 77 there is a meniscus-shaped hyaline mass in the vessel wall, staining red with van Gieson's stain (Fig. 6).

After a short distance, in which the wall of the artery was almost normal, a thickening of the wall appeared again in section 84. In 86 a process springs from the wall giving the lumen a horseshoe shape (Fig. 4). In 89 the lumen is somewhat wider, but in 95 it is almost obliterated, to become wider beyond 96. In 103 a small twig is given off whose wall has undergone hyaline degeneration but has normal endothelium. In 134 a small branch is given off which appears to be obliterated; it is entirely hyaline.

The inferior temporal vein (II.) has at first a normal or perhaps a slightly thickened hyaline wall, which on one side exhibits a great number of nuclei representing an increase of the cells of the adventitia or interna in consequence of chronic degenerative disease. The endothelium is normal. The wall is slightly wrinkled and collapsed from post-mortem changes. About the 28th section the wall begins to show sclerotic thickenings. In section 31 the vein divides into two branches which continue in a common sclerosed and thickened wall to section 40, where one of the branches divides again and the smaller twigs show varying degrees of sclerosis up to complete obliteration of the lumen. Fig. 10 represents one of the main branches thickened on one side. Fig. 17 represents a smaller twig which has undergone complete hyaline degeneration. Similar changes are found in the other venous branches. From some of these vessels small new-formed vessels of a capillary type are given off which run for some distance in the adventitia of the vessel and then pass out into the retinal tissues. Fig. 14 shows a vein in which the endothelium has

proliferated greatly on one side, and mitotic figures are found in the cells. In Fig. 13 two twigs from a vein run first in the adventitia and then are lost in a new formation on the limitans interna.

In Fig. 12 is shown a large vessel with a thick sclerotic adventitia in which run numerous tortuous twigs. Among the branches of this vessel are three small twigs which end in three groups of cells, in which, however, a lumen filled with red corpuscles can still be detected (Fig. 21).

These groups of cells are sharply outlined, and the nuclei are larger than those of leucocytes and stain more darkly. They are well seen when the group lies at the end of a vessel cut longitudinally (Fig. 20). They represent the ends of new-formed vessels which have sprung from the veins that were degenerated and obliterated.

The inferior temporal artery is at first normal, and then begins to show the changes found in the other arteries. In Fig. 8 the lumen is seen to be very small.

In the upper half of the ball the changes in the larger vessels do not differ particularly from those found in the lower.

Near the equator of the eye a great number of miliary aneurisms was found. These consist either of a spindle-formed dilatation of a capillary or of a spherical body in connection with a small vessel. They are found mostly in the inner and middle layers of the retina and are covered with a sheath formed from the surrounding retinal tissues. In the beginning they have a vitreous or a finely fibrous wall with few nuclei and are filled with red blood corpuscles. Later there is an infiltration about the aneurism, the blood corpuscles break down and are absorbed, the tissues shrink, and the aneurism becomes obliterated (Figs. 22-26).

One peculiar feature was the presence of convolutes of small thin-walled vessels in the retina (Fig. 27), or extending out free into the vitreous (Fig. 28), corresponding to those frequently seen in glaucoma when the retinal vessels have been obliterated.

There has been a formation of new connective tissue on the membrana limitans interna at some places, the shrinking of which has produced a detachment of the membrane (Figs. 29, 30, and 31).

The vitreous shows the usual finely fibrillar structure and contains many blood corpuscles and many granules of blood pigment.

The œdema of the retina was limited almost altogether to the

region of the posterior pole, but here the retina was in places twice as thick as the normal. There was a general diffuse œdema of all the layers and also the localized extravasations which lie in the arcades formed by the stretched and separated groups of Müller's fibres. These extravasations are composed mostly of homogeneous albumen and more rarely of fine- or coarse-meshed networks of fibrin with some red blood corpuscles. Fatty granular cells were not found.

In all layers of the retina, but chiefly in the inner and middle, are numerous diffuse hemorrhages and also some subretinal hemorrhages. The blood corpuscles are well preserved.

The ganglion-cell and nerve-fibre layers are atrophic and few ganglion cells remain. The pigment epithelium is normal. The chorio-capillaris is moderately atrophic. The ciliary vessels and the vessels of the ciliary body and iris are normal. The iris in its periphery is united to the cornea. At the bottom of the anterior chamber are some red blood corpuscles and fibrin.

To recapitulate, we find a marked narrowing of the lumen of the arteria centralis retinæ from endarteritis proliferans. Whether this narrowing had led to complete, permanent blocking it is difficult to say. In all the sections the lining layer of endothelium could be found even when the lumen was apparently obliterated. I believe, therefore, that in life there had been at least a narrow lumen, which had become closed by post-mortem contraction of the vessel walls. No complete closure could have existed for any great length of time or the endothelial cells would not have been so readily recognizable. From the state of the blood no conclusions could be drawn.

There is no doubt but that we had to do here with a primary endarteritis proliferans. In cases of obliteration of long standing the differentiation between this condition and old cases of thrombosis or embolism might be difficult.

The long existence of the new proliferations is indicated by the presence of regressive changes—their being composed of fibrillary reticular tissue poor in nuclei.

The retinal arteries show all the arterio-sclerotic changes, ranging from diffuse or unilateral crescentic thickening of the intima, consisting of more or less cellular fibrous tissue,

up to the almost complete blocking of the lumen with the proliferated tissue of the intima. The latter tissue was composed of closely packed cells poor in protoplasm with little intercellular substance.

The lining endothelium could not be differentiated from the underlying cells. That these changes also were not the result of thrombosis or embolism is shown not only by the histological structure but also by the absence of remnants of foreign bodies and of granules of blood pigment and of foreign-body reactions in the vessel walls.

An indication that these proliferations of the intima were not very active is the rare occurrence of mitotic figures. Only two were found, while in the new tissues on the limitans interna, the groups of cells at the ends of new capillaries, and about some of the veins these figures were very numerous. It is noteworthy that the changes occur at intervals, particularly the excessive proliferations of the intima which were found here and there along the course of the artery.

In some branches there was total obliteration, the vessel being transformed into a concentrically fibrous tract, which from analogy one must suppose to be the result of endarteritis proliferans.

At some points there was a slight infiltration of the adventitial sheaths with leucocytes. Even the small number of the infiltrating cells and their unilateral arrangement aroused the suspicion that their presence was due to an excitation which had not proceeded from the lumen of the vessel, but careful examination showed that at such points an obliterated vessel always crossed the artery, and to this was due the infiltration.

More rarely there were remains of previous hemorrhage at these points, and these could be considered to have caused the migration of leucocytes by chemotactic processes.

The veins were in part normal and in part sclerotic. How far the intima and adventitia were involved in the changes cannot be determined from the examination of our specimens.

It was very remarkable that two venous lumina often were enclosed for a considerable distance in a common wall—a

condition which to my knowledge has not been previously observed ophthalmoscopically or microscopically.

In one vein, phlebitis proliferans was found over considerable areas, both adventitia and intima being involved. Its relation to the sclerosis of the wall described above is still a disputed question. Phlebitis proliferans has rarely been described. It is found most frequently after thrombosis. That this was not the case here is shown by the histological structure and the absence of remains of a thrombus.

Peculiar, also, was the formation of new vessels springing chiefly from the veins and ending in groups of nuclei. Some of the smallest venous twigs in the retina were obliterated, but they could always be differentiated from obliterated arterial twigs. The former had a glassy, almost homogeneous wall; while the latter had a fibrillary, concentrically layered wall.

The hemorrhages were of two distinct varieties without transition forms. There were large collections either of dark greenish-yellow granules of blood pigment or of well-formed blood corpuscles. No notched or broken-down corpuscles were found—an indication that the extensive hemorrhages dated from two different times. The former were due to the temporary blocking of the central artery from endarteritic proliferation; they are represented by the blood pigment. The blood corpuscles represent a second hemorrhage due either to a fresh interruption of the blood current from the endarteritis or to the onset of acute glaucoma. No connection between the miliary aneurisms and the hemorrhages could be made out. The latter took place directly from the vessels either through rupture or by diapedesis.

Miliary aneurisms have often been observed ophthalmoscopically in eyes with arterio-sclerosis, and they have been studied microscopically by Mackenzie, Nettleship, and Litten.

The importance of endarteritis proliferans was noticed by Heubner in 1874. He regarded it as a specific syphilitic product. Friedländer later combated this idea; he found endarteritis proliferans or, as he called it, arteritis proliferans,

chiefly in connection with inflammatory processes in the neighborhood, yet he conceded the possibility of its primary development. Baumgarten recognized as undoubtedly specific only that form in which small gummous nodules had developed in the adventitia.

Recently endarteritis proliferans has engaged the attention of surgeons, particularly since it has been recognized to be the cause of spontaneous gangrene. They do not regard lues as the only etiological factor, but believe the endarteritis to be mostly a symptom of arterio-sclerosis, which owes its origin to the most varied chronic noxious influences. Ribbert states that in arterio-sclerosis the changes affect all the coats of the larger vessels, but particularly the intima in the smaller vessels.

In our patient there was no sign of syphilis, but the arteries were very rigid and the endarteritic changes found in the retinal vessels, therefore, are to be considered to be due to the general arterio-sclerosis.

In 1872 Michel described the clinical picture of thrombosis of the central vein as follows: Persons of advanced age with sclerosis of the peripheral arteries and slight hypertrophy of the heart, suddenly, without prodromes, notice a failure of vision which is not so complete as that following embolism of the central artery, to which in other respects the clinical picture is similar. The vision improves gradually, though often only temporarily, until a marked disproportion exists between the ophthalmoscopic picture and the acuteness of vision.

He distinguished three degrees of intensity according to the greater or less extent of the blocking: excessive bloody suffusion of the disc and surrounding retina, with dilatation and tortuousness of the veins in cases of complete stoppage; fewer hemorrhages but equally dilated veins in cases of partial blocking of the vein; still fewer hemorrhages but considerable tortuosity of the veins in cases in which the partial thrombus was small. The arteries for the most part are narrow.

After transient improvement recurrences frequently take place, manifested to the patient by sudden diminution of

vision, and to the physician by the appearances of fresh extravasations, a greater dilatation of the veins, and an almost complete disappearance of the arteries. After repeated recurrences vision is lost entirely.

The marked narrowing of the arterial blood column which characterizes every recurrence, even when the arteries in the period of improvement had nearly regained their usual calibre, was explained by Michel on the supposition that the obstruction to the blood current is continued so far back that only small quantities of blood can be thrown into the arteries by the weakened heart. I cannot agree with this view; in embolism of a branch of the central artery, when there is otherwise no disease of the vessel, the artery retains its normal calibre centrally from the point of stoppage, although in most of these cases the vessels are sclerotic and the heart is weak. I believe rather that the diminished calibre of the arteries is to be referred to arteriosclerotic thickening of the vessel walls,—a condition whose significance and ophthalmoscopic recognition have been treated of in many recent articles. Michel himself alludes to this in the description of the case which he examined microscopically, his illustration, 5 A, showing apparently a thickened intima. A further argument in support of this view is his statement that the blood column becomes narrower as the artery approaches the disc. The simple sclerotic changes in the arterial walls involve chiefly the portions of the vessels near the disc.

Michel found the central vein blocked with a mass composed of cells with spindle-shaped nuclei, white blood corpuscles, and some fibres. In most of its extent this mass was adherent to the inner wall of the vein, but at some points there was a narrow cleft between them. The walls of the vein were slightly thickened.

Michel called attention to the surprising lack of blood-pigment in this formation. This fact and the lack of marked changes in the wall of the vein suggest the possibility that the blocking mass is the product of an endophlebitis proliferans. In the larger vessels, organization of a thrombus is always accompanied by infiltration and proliferation of all

the coats of the vessel. Whether the organization of a thrombus in a smaller vessel can proceed from the intima alone is questionable.

[The author then discusses various other reported cases of thrombosis or phlebitis of the central vein and concludes that the diagnosis was justified only in the cases of Michel, Weinbaum, and Türk.]

In these cases a mass in organic connection with the vessel wall blocked the lumen of the central vein; yet it is doubtful whether the mass was an organized thrombus or the result of phlebitis proliferans.

How is our case to be explained?

There is a possibility that there had been previously blocking of some arterial branches, whose subjective symptoms—defects in the visual field—had not been noticed by the unobserving patient. The complete fibrous obliteration of some branches is probable.

The sudden diminution of vision in the entire visual field of one eye, acute affection of the optic nerve excluded, can only be due to blocking of the central artery or vein.

In our case the endarteritis proliferans was the cause of the interruption in the blood current.

The proliferation beginning in the intima narrowed the lumen more and more, without causing any noticeable disturbance of vision. Then the sudden blocking of the lumen interrupted the blood current and led to a more or less extensive necrosis of the nervous elements of the inner layers of the retina, manifesting itself in marked diminution of vision.

The sudden closure of the remaining lumen may have been due to two causes which are of importance as regards the subsequent results. The cause may have been a lowering of the blood pressure. A time may have come when the pressure was less than that of the contraction of the arterial wall through the muscular coat and the elastic fibres. A direct opposition of the wall of the vessel to the wall of the proliferation would then have closed the passage which the blood until then had maintained. Again, the contraction of the ring muscle of the artery may have been the primary

cause, its strength becoming greater than the existing blood pressure, and the same mechanical result is produced as in the former case.

A point of importance in this mechanism is the fact that the true proliferation of the intima takes place on one side of the vessel only, contracting the lumen to a narrow cleft, which can close suddenly more readily than can a small central lumen caused by a regular concentric proliferation of intima.

Less likely is the occurrence of a sudden œdematous swelling of the new-formed tissue, which after a time passes off.

I would also exclude the idea of a blocking by blood corpuscles or the formation of a secondary thrombus which gradually disintegrated. In our case at least the surface of the endarteritic proliferation showed no signs of having broken down so that adherence of the blood corpuscles would be favored.

The post-anæmic hemorrhages (hemorrhagic infarcts) are readily explained by the mechanism of the blocking. With the increase in blood pressure or the decrease in the energy of contraction of the arterial wall, the lumen again becomes patulous, the blood again circulates through the sclerotic vessels which have been further affected by the temporary ischæmia, and extravasations take place whose number depends upon various circumstances, such as the length of time that the circulation has been interrupted, the degree of the sclerotic changes, and the tension and composition of the blood.

As regards the further course, there are two possible explanations. Either there are regressive changes in the proliferation of the intima, the shrinking of the tissues again widening the lumen, or a permanent blocking is produced by the union of the walls of the vessel. In the latter case the vessel appears finally as a white cord. This is the rarer result.

There is also a possibility of restoration of circulation by the canalization of the blocking mass. Since this requires time, extensive retinal and vascular changes will occur before the process is completed.

When the etiology is as it was in our case, the narrowness of the arteries is easily comprehensible. In part it is the visible expression of the arterio-sclerotic affection, and in part the result of the elastic and muscular contraction in consequence of the greatly decreased current of blood; with an increase in the amount of circulating blood the vessels may become fuller.

The marked tortuousness and dilatation of the veins, in so far as it is not physiological, is explained by compression in the nerve head from the post-anæmic œdema and the swelling of the necrotic nerve fibres, particularly in the region of the lamina cribrosa. The tortuousness, particularly that in a plane perpendicular to the plane of the retina, is favored by the thickening of the retina from serous infiltration, the retina in our case being twice its normal thickness at the posterior pole.

As to the glaucoma that developed later, this can hardly be brought into connection with the temporary closure of the arteries.

It is well known that glaucoma patients frequently suffer from arterio-sclerosis. In most glaucomatous eyes, chronic degenerative changes are found in the retinal vessels. To what degree they are primary and to what degree they are secondary is not yet positively settled.

I incline to the view that circulatory disturbances in the retina and increased tension are to a certain extent coördinated and are the expression of a common cause, viz., the vascular alterations in the body generally and the eye.

Because of the sudden closure of the central artery of the retina our case bears a certain resemblance to one of embolism of the central artery. Extensive hemorrhages are rare in the latter affection, but small hemorrhages are almost always to be found.

The clinical picture in our case had much in common with that described by Michel as characteristic of thrombosis of the central vein, and it differs from that of so-called embolism of the central artery only through the greater number of hemorrhages found.

Arterio-sclerosis was formerly thought to be an affection

of middle life or old age exclusively, but now it is known to exist in younger persons as well. In the eye, the affection reveals itself by a sudden, more or less marked, diminution in vision. The degree of functional disturbance depends chiefly upon the duration of the interruption of the circulation. The longer this lasts the more the nervous elements of the inner layers of the retina are damaged, while if the interruption is of short duration the affected nerve elements may in part become restored.

Ophthalmoscopically there are found more or less numerous extensive extravasations, hemorrhages, and white patches, particularly in the posterior segment of the ball, which in time become absorbed. There is also more or less cloudiness of the retina, particularly about the posterior pole of the eye, which is the expression of œdema and of necrotic swelling of the nervous elements of the inner layers of the retina. With the progressive absorption of the extravasations and the degenerated nervous elements, the markings of the fundus become clearer, the disc becomes sharply outlined, and the atrophic discoloration disappears. Any connective-tissue new-formations on the retina are visible as grayish-white patches.

The arteries are narrow and exhibit local arterio-sclerotic changes such as constrictions, white sheaths, and the transformation of certain areas into grayish-white strands. With the increased blood-current which follows dilatation of the constricted places when the new tissue is absorbed, the vessels become better filled.

Both in the condition of the arteries and particularly in the condition of the veins are these cases to be distinguished from cases like Michel's, which are due to thrombosis of the central vein. In the latter cases the veins show a high degree of congestion, while in cases of temporary blocking of the central artery they are normal or but slightly dilated, according to the degree of compression in the nerve head. Recurrences are frequent and finally lead to amaurosis.

I wish to express my thanks to Professor Haab for his interest and assistance in this investigation, and to Professor Ribbert for his kindness in looking over a number of my preparations.

Explanation of the Figures on Plates IX.-XII.

The drawings were done with a Hartnack obj. 5, oc. 2, the outlines being traced with Oberhäuser's apparatus.

Fig. 1.—Transverse section of optic nerve (22). Both central vessels are surrounded by a common broad adventitia. The central artery has a normal muscularis and elastica. The intima is greatly thickened by cellular proliferation so that there is left only a cleft-shaped lumen lined with epithelium. The central vein, whose wall is normal, contains homogeneous albumen and formed elements of the blood (post-mortem clot).

Fig. 2.—Flat section of the posterior portion of the ball (36). Right margin of the excavation in the disc. The artery is cut obliquely. The end of the endarteritic proliferation which is attached by a broad base to the otherwise normal wall. The artery and vein are filled with a post-mortem coagulum. (In the following figures the contents of the vessels have been indicated merely by drawing in a few red blood corpuscles.)

Fig. 3.—Optic nerve (37). An obliterated fibrous artery. Elastica still recognizable. Nuclei of muscular coat and intima poorly stained (atrophy).

Fig. 4 (86, lower half).—Artery 2 with excessive proliferation of intima on one side.

Fig. 5 (54, lower half) —Artery 1 with sclerotic thickening of the intima, particularly on one side.

Fig. 6 (76, lower half).—Artery 2 with sclerotic thickening of the intima and hyaline masses.

Fig. 7 (42).—Artery 3a with an obliterating proliferation of intima.

Fig. 8.—The same vessel more peripherally with complete fibrous degeneration of the thickened intima.

Fig. 9 (41, optic).—The two branches of a normal vein, one with a normal wall, the other with sclerotic thickening.

Fig. 10 (54).—Vein II.a, 1 with excessive unilateral thickening of the wall.

Fig. 11.—Vein II.a, 2d with branches in a common sclerosed wall.

Fig. 12 (47).—The same vein more peripherally. The branches running in the wall are here cut more longitudinally.

Fig. 13 (49).—Vein II.a, 2 cut obliquely. Two branches pass to a proliferation of the limitans interna.

Fig. 14.—Vein II.a, 2, phlebitis proliferans partialis.

Fig. 15 (108).—Vein II.a, 2*d* (above to the left) and II.b (below to the right) in a common sheath which in part is sclerosed, in part cellular.

Fig. 16 (112).—The same trunk. The vein II.a, 2*d* has broken up into branches which are lost in the retina. II.b has retained a much wider lumen and has a moderately sclerosed wall.

Fig. 17 (117).—A venous branch obliterated by hyaline degeneration.

Fig. 18.—An obliterated arterial twig, a continuation of that in Fig. 3. The wall is necrotic and has no nuclei. Within the vessel are large finely granular cells with a large pale nucleus (necrotic, swollen endothelial and intima cells?).

Fig. 19.—Superior nasal vein, two lumina in a common wall, the intima of one poor in nuclei and of the other rich. In the common adventitia lie large cells with a finely granular protoplasmic body and a large pale nucleus (degenerated cells).

Fig. 20 (80).—Vein II.a, 2*d* and II.b in a common wall, in part sclerosed and in part rich in nuclei. From II. *b* a branch passes off to end in a group of cells.

Fig. 21 (28).—Three groups of cells in which fine vessel lumina can be recognized. They are the terminations of a bundle of vessels springing from the vein to the left. To the right, thickening of the membrana vitrea from cellular proliferation.

Figs. 22–26.—Miliary aneurisms in different stages of development.

Figs. 22 and 23.—Small aneurisms at an early stage.

Fig. 24.—Several aneurisms with necrotic walls.

Fig. 25.—Aneurism with round-celled infiltration. The sac shrunken on account of absorption of the blood.

Fig. 26.—Organized miliary aneurism (final stage).

Fig. 27.—Vascular convolution in the retina.

Fig. 28.—Vascular convolution passing from the retina out into the vitreous.

Fig. 29.—Plaiting of the basilar membrane while the membrana vitrea, whose nuclei are increased, passes smoothly over it.

Fig. 30.—Detachment of the membrana vitrea with cell proliferation, new-formation of vessels, and a nodular proliferation of tissue.

Fig. 31.—Marked elevation of the membrana vitrea from the

plaited retina with cell proliferation and new formation of vessels in the interspaces.

Fig. 32 (21, optic nerve).—Transverse section of a posterior ciliary artery. At the time of enucleation the muscularis was detached from the adventitia and blood passed in between the two. The intima rolled inward and is here cut in flat section and the elastica is thrown entirely into plates.

ANATOMICAL EXAMINATION OF A CASE OF
SO-CALLED COLOBOMA OF THE OPTIC
NERVE.

BY DR. MARTIN GOERLITZ, FREIBURG-IN-BADEN.

(With two figures on Plates XIV.-XV. of Vol. XXXV., German Edition.)

Abridged Translation by Dr. WARD A. HOLDEN.

IN 1858 von Ammon first described a peculiar malformation of the optic nerve in a sheep embryo under the name "coloboma of the optic nerve." Thirty-three years later Caspar and Krüger collected the reports of forty-six cases of this sort from literature, and in recent years the number has increased considerably. Although so many cases have been observed clinically, only about seven have been examined anatomically, which is to be regretted, since the clinical descriptions vary so greatly in matters of detail that it is often questionable whether a case so designated is really one of coloboma of the optic nerve or of coloboma of the retina and choroid.

Through the kindness of Professor Ziegler I have been enabled to examine anatomically an eyeball with a clinical diagnosis of coloboma of the nerve, a diagnosis that was found to require considerable modification.

The right eye was normal. In the left, the cornea appeared smaller than normal. The optic disc appeared about three times as large as normal, gleaming white in its lower and lower-outer portions and elsewhere of yellowish color. It was sharply outlined, obliquely oval, and bordered above and below by a line of pigment. Parallaxic movements

showed that the disc was greatly excavated, particularly in its lower portion. The fundus elsewhere was normal. The retinal vessels appeared with a sharp curve at the margin of the disc, only one or two vessels emerging near its centre.

Twenty-four hours after death, the left eye with a portion of the optic nerve was removed and hardened in 4 per cent. formol for three days. The antero-posterior diameter of the ball was 24.5 *mm*, and the cornea was 8 *mm* high and 9 *mm* broad. The sheath of the optic nerve passed over at a right angle into the sclera everywhere except directly downward, where there was a bulging outward of the sheath. Other than this and the small size of the cornea the eyeball was of normal appearance.

After the ball had been divided equatorially the optic disc was found to be 3 *mm* in vertical diameter and 2.25 *mm* in horizontal. The disc consisted of an upper portion, flat and sloping downward and backward, and a lower portion which was more deeply sunken. Between the latter and the sharp lower margin of the disc was a pocket-like depression.

Portions of both the anterior and posterior segments of the ball were imbedded in celloidin, cut in vertical sections, and stained by van Gieson's method. A section through the most sunken portion of the disc is represented in Fig. 3, Pl. XIV.-XV. The distance between the upper and lower margins of the foramen scleræ is increased to double the normal, but only about half of the space is filled by the optic nerve, the other half forming the entrance to a recess composed of thickly interwoven tracts of dense connective tissue, filled with a looser tissue to be described below, and corresponding to the bulging of the sheath of the nerve inferiorly.

The optic nerve itself is of normal thickness, but its interstitial connective-tissue is excessive, and the intervaginal space is considerably dilated superiorly and obliterated below by the recess.

The sclera above preserves its normal relations to the lamina cribrosa, while below at the margin of the nerve it is defective. The defect is occupied by a recess whose irregular upper wall is continuous with the lamina cribrosa and the

lower wall with the sclera below the defect. The cavity is filled with a peculiar, fine-fibred tissue with many small dark-staining nuclei, through which run in all directions tracts of connective tissue of varying thickness.

From the optic disc the non-medullated nerve fibres run upward into the retina in normal fashion; downward they pass into the defect, forming the fine-fibred tissue just described, and then pass over into the retina below.

The retina is fairly normal; but over the scleral defect there is no trace of retina or choroid except the mass of fibres corresponding to the nerve-fibre layer of the retina and some groups of peculiar nuclei which may represent the nuclear layers of the retina.

The choroid nowhere exhibits signs of previous or existing inflammation.

The lamina cribrosa is defective in places, exhibiting a central excavation in Fig. 3 and another defect in the upper part of the nerve in Fig. 4. The central vessels enter the nerve 4 *mm* behind the lamina cribrosa and divide just below the centre of the nerve head.

To sum up: this was a case of unilateral malformation of the disc and adjacent parts which corresponded to the ophthalmoscopic picture usually called coloboma of the nerve or sheaths of the nerve. Macroscopically the enucleated ball showed a small cornea and a dilated intervaginal space. Below the nerve and between the sclera and the sheaths of the nerve was a small elevation. The optic disc was enlarged in all its diameters and depressed in its lower portion, while its vessels had an anomalous course.

Microscopically there was found a defect in the choroid leading into a circumscribed ectasia of the sclera having irregularly thickened walls. In the defect the choroid was wanting entirely, as was also the pigment epithelium. The scleral defect was filled with nerve fibres running from the disc, and a trace of other retinal elements. The optic nerve was fairly normal except for some irregularities and defects of the lamina cribrosa. The intervaginal space was conspicuously distended.

Comparing the anatomical conditions found in this case

with those found in cases previously published (abstracts of which appear in the original but will here be omitted—*Trans.*), it appears undoubtedly that this malformation is not so much a coloboma of the optic nerve as a coloboma of the choroid and retina with the secondary formation of a scleral cyst at the lower margin of the disc.

Explanation of the Figures.

Plate XIV., Fig. 3: *a*, retina; *b*, pigment epithelium; *c*, choroid; *d*, sclera; *e*, optic nerve; *f, f*, dural sheath; *g*, pial sheath; *h*, fibres of the arachnoid sheath; *i*, intervaginal space; *k*, thickened wall of the scleral ectasia; *l*, thinnest portion of the wall; *m, m, m*, cyst within the ectasia and its walls; *n*, excavation of the lamina cribrosa; *o*, connective-tissue tracts in the interior of the cyst; *p*, vessel cut longitudinally.

Plate XV., Fig. 4. A section through the lateral portion of the coloboma. *a-o*, as in Fig. 3; *p*, crossing of the fibres from the depth of the cyst and those from the disc; *q*, branch of the central artery.

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DISTENTION OF THE SHEATH OF THE OPTIC NERVE WITH CEREBRO-SPINAL FLUID. OSTEOPLASTIC RESECTION OF THE OUTER WALL OF THE ORBIT (KROENLEIN'S OPERATION).¹

BY MATTHIAS LANCKTON FOSTER, M.D.,

ASSISTANT SURGEON MANHATTAN EYE AND EAR HOSPITAL, NEW YORK CITY.

A BOY six years old was admitted to Dr. Pomeroy's service and placed under my care in the Manhattan Eye and Ear Hospital, May 4, 1900. He had been brought by his mother simply to have his left eye straightened and so to improve his appearance. According to her statement the eye had been slowly becoming more and more prominent and turned towards the nose for about three years, but had caused no pain or discomfort.

When the patient was admitted to the hospital there was a moderate degree of exophthalmos of the left eye, the cornea of which was turned upward and inward, and the eye had lost all power of abduction. Palpation in the lower, outer part of the orbit revealed a freely movable, smooth, firm tumor, apparently about the size of a chestnut. Vision was uncertain as the child could not read, but was at least $\frac{20}{100}$. There was no optic neuritis or other lesion in the fundus.

From the very slow growth of this tumor, its mobility, its apparently small size and the absence of a neuritis it was thought to be benign, not connected with the periosteum or the optic nerve, and capable of being easily enucleated through an incision into the conjunctiva. But as there was an element of doubt whether it could be enucleated thus easily it was deemed best to make

¹ Patient exhibited before the Ophthalmological Section of the Academy of Medicine, May 21, 1900.

the primary incision in such a manner as to facilitate the resection of the outer wall of the orbit if this should be found necessary. Accordingly a curved incision was made through the skin so as to lay bare the margin of the outer wall of the orbit, the periosteum was divided along this margin, elevated from the orbital surface of the bone as far as the outer angle of the spheno-maxillary fissure, and then cut vertically to give access to the contents of the orbit. A small quantity of fat was removed, some pushed aside, and an attempt made to enucleate the tumor. It still seemed small and free, but evaded every attempt to secure it until caught in a strabismus hook, when it was demonstrated to be firmly attached and incapable of removal in such a manner. The orbital plate of the malar bone was then divided with mallet and chisel horizontally outward from the spheno-maxillary fissure through the upper edge of the root of the zygomatic process, and again obliquely upward and outward from the fissure through the external angular process of the frontal bone. The bony flap thus formed was rolled outward with a strong pair of forceps, leaving a space through which a competent examination of the contents of the orbit could be made for the first time. This revealed the presence of a large pyriform tumor attached at its narrow end to the eyeball, with its base in the apex of the orbit and corresponding longitudinally with the course of the optic nerve, which could not be felt elsewhere. Anteriorly it had doubled on itself so as to present the convexity of the fold in the lower and outer part of the orbit, where it had been felt and mistaken for a small, free tumor. During this examination, which was made with the finger as gently as possible, the pupil suddenly dilated, perhaps from traumatism to the lenticular ganglion, which had probably been forced out of its normal position. When drawn into view the tumor exhibited the bluish color characteristic of a collection of fluid in a thin sac of connective tissue. It was easily separated from all the surrounding tissues except at the apex of the orbit, apparently about the optic foramen, and at the eyeball, to which it was firmly attached in a circle of the size of the optic nerve at its entrance into the globe. About three drachms of fluid were aspirated and the tumor then collapsed. During this aspiration the needle was introduced two or three times without obtaining fluid, possibly because the point of the needle was imbedded in the tissue of the nerve itself. This fact is worthy of mention because an injury thus inflicted may have been at least

partially the cause of the subsequent rapid atrophy of the nerve. By this time I had become convinced that the sac was the sheath of the optic nerve so I tore it longitudinally, introduced a strabismus hook through the opening, caught the nerve, drew it forward, and demonstrated it to be present and free in the cavity. This aperture was then torn as large as was practicable as a precaution against a reaccumulation of the fluid, but it did not seem to me to be wise to take away a part of the sheath of the nerve. The tilted portion of the bone was then put back without difficulty, the periosteal flaps were drawn together over its surface, but not sutured, and the superficial wound closed. A drain of sterilized gauze was left in for forty-two hours, at the end of which time it was removed and union by first intention secured throughout.

A slight chemosis and swelling of the lids appeared and persisted for a few days, but convalescence was uneventful. A week after the operation it was noticed that the left nerve was atrophic; after another week it was still more so, and vision had fallen to counting fingers at from two to three feet. There can be little doubt that this atrophy was the result of injury inflicted on the nerve during or after the operation, but whether it was due to the traction made upon it during the earlier attempts at enucleation, to the sudden removal of the pressure of the surrounding fluid, to wounds with the aspirating needle, or to its involvement in the agglutination and healing of the wounded tissues, is quite uncertain.

Two weeks after the operation the left cornea was discovered to be anæsthetic, although otherwise in a perfectly healthy condition. In four weeks it seemed to have recovered a certain degree of sensibility, but was still far from being normal. The dilatation of the pupil which occurred during the operation was persistent a month later, though not to as extreme a degree. All power of abduction still remained absent.

The contents of the tumor were submitted to the pathologists of the hospital who furnished the following report:

"The specimen, 3 cc of limpid fluid, was examined chemically and microscopically. It showed no cellular elements, but contained albumen, approximately one eighth by bulk, and chlorides. The nitric acid test, the nitro-magnesium test, the picric acid test, all proved positive. The silver nitrate test was used for the chlorides and threw down a marked precipitate. Diagnosis—Cerebrospinal fluid. — C. W. Kinney, M.D., E. S. Thompson, M.D.,
Pathologists.

This case is of interest both on account of the condition found to be present and of the operation which was performed. The case was one of distention of the sheath of the optic nerve with cerebro-spinal fluid, a condition which has been rarely if ever before described, and the diagnosis could hardly have been made without an enlargement of the means of access to the contents of the orbit. In the monograph of Klingelhoeffer is a classification of orbital cysts credited to Berlin, in which these are divided into cephaloceles and true cysts. Cephaloceles are described as congenital cerebral herniæ found to enter the orbit only at the junction of the frontal and ethmoid, the frontal, nasal, and ethmoid, and the frontal, ethmoid, and lachrymal bones. True cysts are separated into *a*, cysts from constriction; *b*, extravasation cysts; *c*, exudation cysts; *d*, dermoids; *e*, mucous cysts; *f*, echinococcus cysts. In the case here described all these forms of true cysts can be excluded at once except those classed as constriction or exudation cysts. Under the former heading two cases are described: in one the cystoid sac contained no fluid while two cerebral herniæ lay adjacent to it; in the other a condition was described which appears to be identical with that of a case published by Delpech in 1828. The patient was a man twenty years old who had had a tumor in his left orbit since he was eight years of age, and died of meningitis after an operation. On autopsy it was found that the cyst extended into the brain and that on the other side there was a smaller cyst. Delpech's patient was a man twenty years old who had had the tumor since his eighth year. He evacuated a transparent yellowish fluid by means of an incision through the lower lid, introduced his finger into the cavity, and passed it through the optic foramen. The patient died apparently of meningitis, and on autopsy it was found that the cyst extended back into the brain substance and that the left optic nerve had disappeared. A sero-mucous cyst in the substance of the brain on the other side rendered it probable that the orbital cyst was an extension of a similar one outward rather than a distention of the sheath of the nerve. The case described by Klingelhoeffer he is inclined to class as a cyst from constriction,

albeit with a certain degree of hesitation. The contents were lost, the walls were adherent about the margin of the sphenoidal fissure, and the microscopical examination of the portion of the cyst wall which was removed showed some similarity between it and the dura mater.

The distinction between these cases and encephaloceles I am unable to appreciate. In the first case the cyst was associated with two cerebral hernias; in the second a cerebral cyst was supposed to have pushed its way through the optic foramen into the orbit; in the third there seems to have been a membrane derived from the dura mater adherent to the margin of the sphenoidal fissure, which formed a sac filled with a fluid of unknown composition; in all the origin appears to have been in the protrusion of some of the contents of the cerebral cavity into the orbit. Under exudation cysts Klingelhoeffer refers to a case published by Berlin and adds another diagnosed by Saltini as a hygroma of the bursa between the levator palpebræ and the superior rectus, a condition quite different from that found in the present case, in which the history, taken in connection with the conditions found at the operation and the pathological examination of the contents of the cyst, indicates the possibility of a communication, probably congenital and of a very small size, between the subarachnoid space of the brain and a corresponding space within the dural sheath of the nerve, through which there was a gradual escape of cerebro-spinal fluid from the former into the latter. The existence of such a communication was not demonstrated, and if present may have been closed as a result of the reparative exudations thrown out in its immediate neighborhood after the operation. If it still exists there will be a gradual recurrence of the tumor and a reappearance of the exophthalmos. With no pretence of having made a systematic and thorough investigation of the literature of the subject, but after a consideration of the writings of several authors who have investigated it more or less fully, I believe this case to be one of extremely rare occurrence, if indeed it is not unique in ophthalmological literature.

The absence of optic neuritis is noteworthy because it

demonstrates that a neuritis is not necessarily produced by a collection of fluid in the sheath of the optic nerve, even when it is a very large one, sufficient to distend the sheath greatly.

Temporary resection of the outer wall of the orbit to obtain access to intraorbital tumors was first suggested by Wagner in 1886, but was brought forward more prominently in the following year by Kroenlein, after whom the operation has since been named. At the present time it is little known in this country and therefore its manifest advantages to both the patient and the surgeon in any case of intraorbital tumor of doubtful nature have not hitherto been recognized. The only contributions to the literature of this operation in this country of which I am aware are a translation from the German of Klingelhoeffer's article in the ARCHIVES OF OPHTHALMOLOGY, Jan., 1898, the report of a single case by Arnold Knapp in the ARCHIVES OF OPHTHALMOLOGY, March, 1900, and the description of the operation by Herman Knapp in the *System of Diseases of the Eye* by Norris and Oliver, vol. iii. The German literature, though greater, is still scanty, and this meagreness of experience on the part of the profession is of itself an ample warrant for the publication of every case in which the operation is attempted. But this case I believe to be of peculiar interest as a demonstration of the value of the operation for diagnostic purposes. I think I speak advisedly when I say that the true diagnosis would not have been made if the usual methods of removing an intraorbital tumor had been relied upon. Previous to the operation it was believed by skilful and experienced surgeons that the tumor could be easily shelled out through an opening in the conjunctiva, and its true nature did not occur to one of them. Inasmuch as the nature of the tumor was not recognized when examined after the preliminary incision through the skin, it is not probable that it would have been recognized if it had been approached through the conjunctiva, and, even if it had been, its thorough aspiration would have been a matter of some difficulty. Probably the result of an attempt to remove the tumor through the conjunctiva would have been the immediate

enucleation of the eyeball, which would have caused the complete disappearance of the tumor. The diagnosis of a cyst might have been made from the escape of a large quantity of fluid, but nothing more would probably have been learned about it. The osteoplastic resection of the outer wall of the orbit enables the operator to palpate the tumor, draw a portion of it into view, determine its character as well as is clinically possible, ascertain its attachments, and so enables him to decide, not blindly but with knowledge, what further operation is called for and whether the eye can be preserved or must be sacrificed. The operation itself is not very difficult, though it is a rather delicate bit of chiselling, and, under proper antiseptic precautions, does not appear to be dangerous. In handling a cyst the manipulations must be quite gentle or it may be ruptured, an accident which has happened.

THE AXES OF ROTATION OF THE OCULAR MUSCLES, WITH A SIMPLE METHOD OF CALCULATING THEIR POSITION, AND THE CORRECTION OF CERTAIN ERRORS.

BY HAROLD WILSON, M.D., DETROIT, MICH.

(With three figures in the text.)

THE determination of the ocular muscle-planes and the corresponding axes of rotation has been undertaken by three observers.¹ The measurements of Fick were made upon a single subject, those of Ruete upon four subjects, while the determinations of Volkmann are the mean in each instance, of thirty or more observations.

The method of Fick was to open the orbit from above; prepare the muscles by a careful dissection; to inject the globe through the optic nerve; to pass needles through the globe to fix its position so that the visual line was directed exactly forward; to select three fixed points in the orbit and to measure the distance of the muscular origins and insertions, the summit of the cornea and optic nerve entrance from these points. From these measurements, the necessary calculations were made.

Ruete refined this method somewhat. The roof of the orbit was carefully removed so as to expose the orbital contents from above, and the head was then placed in the upright posture, so as to bring the eyes into the primary position. A saw-cut was made midway between the orbits

¹ Fick, A., *Zeitschrift f. rationelle Medicin*, Neue Folge, Bd. iv., p. 101.

Ruete, *Ein neues Ophthalmotrop*, 1859, pp. 4-10.

Volkmann, A. W., "Zur Mechanik der Augenmuskeln." *Berichte der Leipziger Akademie*, 1869, pp. 27-69.

perpendicular to the frontal bone, through the middle of the *crista galli*, the *sella turcica* and the root of the nose, so that a thread might be carried along it forward, parallel to the horizontally directed visual lines, forming a line of reference. Both eyes were then inflated to their normal shape and a delicate and very sharp needle passed through the eyeball in the direction of the optic axis, penetrating the posterior orbital walls and fixing the eyeballs in position. To prevent displacement of the globe in an antero-posterior direction, the closed eyelids were then covered with a coating of plaster-of-paris. Then the orbital tissues were carefully dissected so as to expose the origin and insertion of the ocular muscles without disturbing their relations. With the aid of thread and dividers, various measurements were then made; such as the angle which each muscle made with the optic [visual?] axis and with the co-ordinate planes, and the distances of the origin and insertion of each muscle (measuring from the geometrical middle of the tendons as Fick had done) from the centre of the globe and from the co-ordinate planes. When these co-ordinates were determined, the positions of the muscle-planes and the axes of rotation were calculated by the polar method given by Aubert,¹ which was the method previously adopted by Fick. Both these authors assumed the centre of the eyeball as the origin of co-ordinates. The *x*-axis coincided with the transverse diameter of the eyeball, the *y*-axis with its antero-posterior diameter, and the *z*-axis with its vertical diameter.

The method adopted by Volkmann was altogether novel and dissimilar. The origin of co-ordinates was placed at the centre of rotation of the eye, 1.29 *mm* back of its geometrical centre, and the first step in the determination was to fix the position of the co-ordinate planes in the orbit. It was assumed that after death the eyes are in their position of rest, and that this is identical with their "primary position." The pupillary distance in 30 living subjects had a mean value of 63.8 *mm*; in 30 dead subjects, 63.1 *mm*; results substantially identical. By definition, the *y*-axis was horizontal, passed through the centre of rotation and the centre

¹ Aubert, G.-S. *Handbuch d. geb. Augenheilk.*, 1st ed., vol. ii., p. 640.

of the pupil, and coincided with the visual line,¹ the two y -axes being parallel and separated by a distance equal to the pupillary distance. The distance between the external orbital borders in 30 living and 60 dead bodies was found to have a mean value of 99.9 *mm*. The difference between the values of the half-pupillary distance and the half-difference of separation of the external orbital borders is then the distance of the y -axis from the external orbital border. This is given as equal to 18.4 *mm*. Assuming the line of junction of the lachrymal and frontal bones as the inner orbital border, and measuring between these two points in the two orbits, the mean of 60 observations was 24.9 *mm*. By a calculation similar to that above, the distance of the y -axis from the inner orbital borders was found to be 19.10 *mm*. The distance of this axis from the outer and inner orbital borders being nearly the same, Volkmann neglected the difference between these values and assumed the y -axis to lie in the horizontal plane of the eyes midway between the outer and inner orbital borders. Similarly, measuring in a vertical plane the height of the orbit from the centre of the pupil to the superior orbital border, the y -axis was determined to lie 16.7 *mm* from the upper orbital border, and 17.2 *mm* from the lower. The position of the x -axis, since the origin is at the centre of rotation of the eyes, and since this lies on the y -axis, is found by determining the distance of the tangent plane to the corneal summit from the external orbital border. This had a mean value of 12.9 *mm*, and the centre of rotation lying 13.54 *mm* behind the corneal summit, we have $13.54 - 12.9 = 0.64$ *mm*, which is the distance of the centre of rotation from the line joining the external borders. Thus the position of the x -axis is established, that of the z -axis follows readily. Having determined the position of the co-ordinate axes in the orbit, the co-ordinates along these axes were

¹ As a matter of fact, a straight line cannot be made to fulfil these conditions. The visual line does not pass through the centre of rotation, and the line of fixation which does pass through this point passes 0.749 *mm* to the nasal side of the centre of the pupil. (If the mean value of the angle γ is 5° , the optic axis and that of the corneal ellipse coinciding, the pupillary centre is 0.229 *mm* to the nasal side of the optic axis. Helmholtz, Knapp, Adamük & Woinow, Aubert, *l.c.*, p. 427.) Then the centre of rotation being 11.18 *mm* behind the centre of the pupil (Volkmann), $\tan. 5^\circ$, if $r = 11.18$, equals 0.978 and $0.978 - 0.229 = 0.749$ *mm*.

determined for the centre of the optic foramen, the points of origin of the recti muscles, the middle points of the insertional tendons of the muscles, the pulley of the obliquus superior, the origin of the inferior oblique. These were found by direct measurement, where possible, of the distance of these points from planes parallel to the co-ordinate planes, passing through fixed and accessible points in the orbit or upon the surface of the eyeball, assisted by certain assumptions and corrections for error, and, where direct measurement was impossible, by certain measurements to fixed points serving as the basis for trigonometrical calculations.

These observations of Volkmann were numerous and laborious, and much more refined and accurate than those of Fick and Ruete. It is impossible to say within what limits of error they may be considered accurate, but in the calculations based upon them are several errors materially affecting the final results, to which, so far as I know, attention has never been called, and which we shall now specifically consider.

In the discussion of the position of the co-ordinate axes in the orbits (p. 36-45 *l. c.*), we find the mean inter-pupillary distance in 30 living subjects given as 63.8 *mm*; in 30 dead subjects, as 63.1 *mm*, or $\frac{63.1 + 63.8}{2} = 63.5$ *mm* as the mean of the 60 observations. Now accurately, this value should evidently be 63.45 *mm*, which would make the half-distance 31.72 *mm*, or, disregarding the hundredths, 31.7 *mm*. Later in the discussion Volkmann uses 31.55 *mm* for this half-value, which is nearly 0.2 *mm* too small. Since the distance of the *y*-axis from the external orbital border involves this value, we find it corrected to be 18.20 *mm* instead of 18.4 *mm* as given. Similarly, the distance of the *y*-axis from the inner orbital wall would be 19.25 *mm* instead of 19.1 *mm*. Volkmann assumes that the difference between the distances of the *y*-axis from the outer and inner orbital border may be neglected, and the axis assumed as lying in the horizontal plane, midway between these points. This difference, as given in his figures, is $19.1 - 18.4 = 0.7$ *mm*, but using the corrected mean values it would be $19.25 - 18.2 = 1.05$ *mm*. It certainly simplifies subsequent calculation to disregard

this difference, but to neglect a whole millimetre for this reason seems to me a questionable procedure in the interest of accuracy. Moreover, with what seems to be a striking inconsistency, a difference of 0.63 mm (0.5 mm ?) in the distance of the y -axis from the upper and from the lower orbital borders is not neglected, but appears in several estimations involving the ratio of these distances. Of course, in any event, however painstaking the accuracy in observation and calculation, the final results can never be anything more than approximations to an ideal average, with which no real case will ever agree, yet granting this as inherent in the problem itself, it is nevertheless necessary to obtain values for this average as accurate as possible. The tables given by Volkmann of the angles which the axes of rotation of the various ocular muscles make with the co-ordinate axes have been repeatedly quoted by subsequent writers substantially as they were originally given. Wieland¹ makes them the basis of a valuable mechanical discussion, and Alf. Graefe² quoted them in his latest treatise on the subject. I have re-calculated these axes by the method given below, and as will be seen by comparing the results, there are a few errors in the current tables, amounting, in the case of the superior oblique muscle, to more than 3° for the value of the angle μ . It is strange that so considerable an error³ as this should so long have passed unnoticed; but that it has done so emphasizes the fact that not a little of our present knowledge of ocular rotations, physiological and pathological, rests upon a very uncertain basis, and that there is need of more extended and more accurate investigation in this department of ophthalmology.

The values, in millimetres, of the co-ordinates of the origin and insertion of the several ocular muscles as found by the three observers above quoted, are given in the following table. Those of Fick and Ruete are measured upon co-ordinate axes having the centre of the globe as the origin, while those of Volkmann are referred to axes having the centre of rotation of the eyeball as their origin.

¹ Wieland, *Archives of Ophthalmology*, vol. xxvii., p. 51.

² Graefe, *G.-S. Handb. d. ges. Augenheilk.*, 2d ed., 1898, T. ii., Bd. viii., p. 3.

³ Approximately equal to an error of 3 mm in the value of a co-ordinate.

TABLE OF CO-ORDINATES OF THE INSERTION AND ORIGIN OF THE OCULAR MUSCLES.

	INSERTION.								
	Fick.			Ruete.			Volkman.		
	x'	y'	z'	x'	y'	z'	x'	y'	z'
Rectus externus....	+ 9.1	- 7.9	0.0	+ 10.8	- 5.0	0.0	+ 10.08	- 6.5	0.0
Rectus internus....	- 9.1	- 7.9	0.0	- 9.9	- 6.0	0.0	- 9.65	- 8.84	0.0
Rectus superior....	0.0	- 7.9	+ 9.1	+ 2.0	- 5.67	+ 10.0	0.0	- 7.63	+ 10.48
Rectus inferior....	0.0	- 7.9	- 9.1	+ 2.20	- 5.77	- 10.0	0.0	- 8.02	- 10.24
Obliq. superior....	+ 4.6	+ 2.7	+ 9.9	+ 2.0	+ 3.0	+ 11.0	+ 2.9	+ 4.41	+ 11.05
Obliq. inferior....	+ 10.4	+ 6.0	0.0	+ 8.0	+ 6.0	0.0	+ 8.71	+ 7.18	0.0
Optic nerve entrance	+ 2.4	+ 11.5	0.0						
Corneal summit....	0.0	- 12.0	0.0						
Diameter of globe..				24. mm.			24.5 mm.		

	ORIGIN.								
	x"	y"	z"	x"	y"	z"	x"	y"	z"
Rectus externus....	- 15.0	+ 31.0	+ 2.0	- 5.4	+ 32.0	0.0	- 13.0	+ 34.0	+ 0.6
Rectus internus....	- 18.0	+ 30.0	+ 4.0	- 14.67	+ 32.0	0.0	- 17.0	+ 30.0	+ 0.6
Rectus superior....	- 16.0	+ 31.0	+ 6.5	- 10.67	+ 32.0	+ 4.0	- 16.0	+ 31.76	+ 3.6
Rectus inferior....	- 17.0	+ 30.0	+ 2.0	- 10.8	+ 32.0	- 4.0	- 16.0	+ 31.76	- 2.4
Obliq. superior....	- 19.6	- 10.9	+ 12.8	- 14.1	- 10.0	+ 12.0	- 15.27	- 8.24	+ 12.25
Obliq. inferior....	- 18.0	+ 30.0	+ 6.0	- 8.1	- 6.0	- 15.0	- 11.1	- 11.34	- 15.43

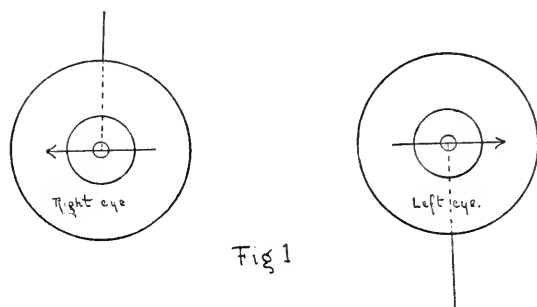
NOTE. — In Fick's co-ordinates there are two evident errors, to which Ruete and Helmholtz have called attention, in the values of y'' and z'' for the obliq. inferior. The tables of Volkman's results given by Aubert (*l. c.*) contain three errors: x' for the obliq. inferior should be + 8.71 instead of - 8.71; y'' for the rect. internus should be + 30 instead of + 3 and z'' for the obliq. inferior should be - 15.43 instead of - 15.46.

Having determined these co-ordinates by any system of measurement, we have the geometrical values upon which to base the calculation of the position of the axes of rotation of the various muscles. Aubert¹ has given one method of effecting this calculation. I beg to submit another, which, though not very unlike, is perhaps more simple.

¹ Aubert, *G.-S., Handb. d. ges. Augenheilk.*, 1st ed., vol. ii., p. 640, from Fick, *l. c.*, p. 112.

Problem. General Statement. The position of the origin and insertion of the ocular muscles being given in space, with reference to three co-ordinate planes passing through the centre of motion of the eyeball (or the centre of the globe, Fick and Ruete), to determine the position of the (instantaneous) axis of rotation of each muscle, the eye being in the primary position, and assumed to be free to rotate about its rotational centre in any direction. These positions to be expressed in terms of the angles which these axes make with the co-ordinate axes.

That is to say, the rotation resulting from the simultaneous contraction of all the fibres of the muscle is assumed to be due to a single force acting in the plane of the line joining its origin and (effective) insertion and the centre of mo-



tion of the globe (this plane being called the "muscle-plane"), and in a direction tangent to the eyeball at the point of (effective) insertion, all resistances, or their sum, being taken as lying in this same plane. The axis of rotation is a line from the centre of motion perpendicular to the muscle-plane, and in a direction so chosen that the rotation of the globe around this axis, due to the pull of the contracting muscle, if looked at along the axis, will be in the same sense as that of the hands of a watch. Thus the axis (half-axis) of the rectus externus muscle of the right eye extends from the centre of rotation upwards, while that of the left eye extends from the centre of motion downwards (Fig. 1). Now it seems more than probable that, in reality, the various resistances offered to the rotation of the eyeball under the pull of any individual muscles are not necessarily to

be compounded into a single resistance lying in the muscle-plane, although the complicated nature of these resistances (*e. g.*, from check-ligaments, lateral elastic extensions of Tenon's capsule, elastic tension of opposing muscle, etc.) renders their accurate determination very difficult, if not impossible. Yet they play such an important part in regulating or modifying the rotations of the eyeball, that an accurate mechanical discussion of ocular movements ought to take some account of their influences. Further, it is assumed that any individual muscle may contract and cause the eyeball to rotate upon the axis of that muscle. As Volkmann has pointed out,¹ if this assumption is admitted, the rotation of the eyeball by any one muscle (accepting Volkmann's determinations of the axes), acting alone, would bring the globe into a position not in conformity with the law of Listing. But since this law must obtain, it follows either that no muscle really acts alone, or that the various elastic resistances which oppose it give a resultant axis of rotation lying in Listing's plane. Yet this criticism is of no present force, since the axes we seek to find are not necessarily those about which the eyeball actually rotates, but those about which it would rotate under the action of the several muscles contracting separately, unconstrained by Listing's law or by any elastic or other tractions to modify the movement. Moreover, the conditions remaining the same, the instantaneous axis of the primary position becomes a fixed axis for the entire special rotation.

We assume three co-ordinate planes of reference, normal to one another, fixed in the eye and passing through the centre of motion of the eye (Volkmann), or the centre of the globe (Fick and Ruete). These planes contain the co-ordinate axes, the x -axis being the line passing through the centres (of motion) of the two eyeballs, the y -axis extending from the centre horizontally backward, and the z -axis extending from the same point vertically upward. Distances along these axes are taken as positive or negative as indicated in Fig. 2.

¹ *L. c.*, p. 66. See also Maddox, *Tests and Studies of the Ocular Muscles*, 1898, p. 97.

Thus a point at the lower extremity of the insertional tendon of the rectus externus muscle would have co-ordinates bearing the following signs, $+x'$, $-y'$, $-z'$.

If we restate the problem in a geometrical form, it becomes:

Problem. To determine the angles made with the co-ordinate axes X , Y , and Z , by a line (the axis of rotation) passing through the origin, and normal to a plane (the muscle-plane) passing through the origin and two given points

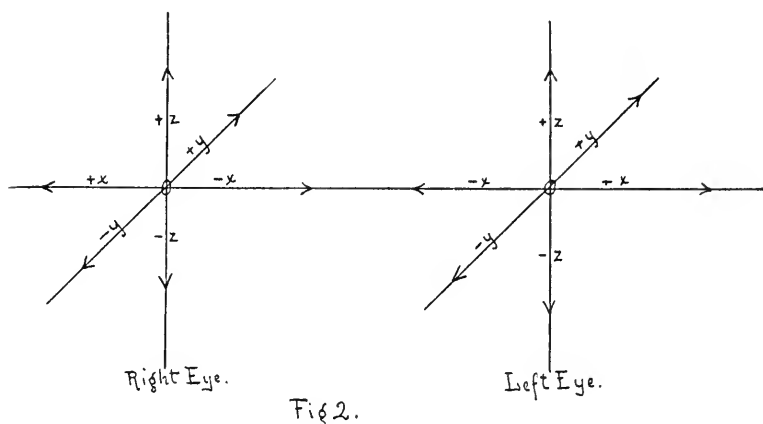


Fig 2.

x' , y' , z' (the insertion of the muscle), and x'' , y'' , z'' (the origin of the muscle).

Solution. The general equation of a plane passing through the origin is

$$Ax + By + Cz = 0$$

Dividing by C ,

$$\frac{A}{C}x + \frac{B}{C}y + z = 0 \quad (1)$$

The equation of a plane passing through the origin and the point x' , y' , z' is, similarly,

$$Ax' + By' + Cz' = 0$$

Whence, dividing by C ,

$$\frac{A}{C}x' + \frac{B}{C}y' + z' = 0 \quad (2)$$

The equation of a plane passing through the origin and the point x'', y'', z'' is, similarly,

$$Ax'' + By'' + Cz'' = 0$$

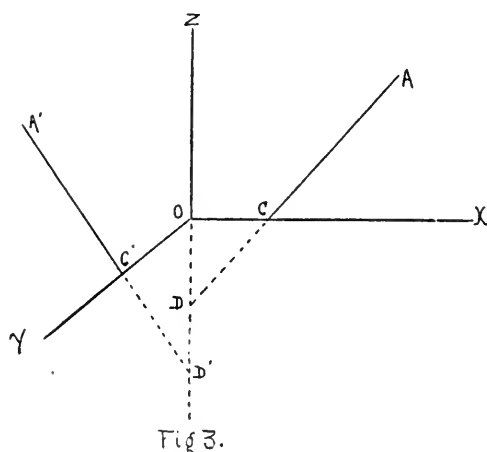
Whence, dividing by C,

$$\frac{A}{C}x'' + \frac{B}{C}y'' + z'' = 0 \quad (3)$$

Solving equations (2) and (3) for the values of $\frac{A}{C}$ and $\frac{B}{C}$

$$\frac{A}{C} = \frac{z'y' - z''y''}{x'y' - x''y''} \quad (4)$$

$$\frac{B}{C} = \frac{z'x' - x'z''}{x'y' - x''y''} \quad (5)$$



Substituting these values of $\frac{A}{C}$ and $\frac{B}{C}$ in equation (1) we have

$$\left(\frac{y''z' - y'z''}{x'y' - x''y''}\right)x + \left(\frac{x''z' - x'z''}{x'y' - x''y''}\right)y + z = (y''z' - y'z'')x + (x''z' - x'z'')y + (x'y' - x''y'')z = 0 \quad (6)$$

which is the general equation of the (muscle) plane passing through the origin and the points x', y', z' , and x'', y'', z'' .

The equations of any line in space, that is, the equations of its traces on the xz and yz planes, are

$$x = az + \alpha$$

$$y = bz + \beta$$

in which a is the tangent of the angle formed by the trace

of the line on the xz plane with the axis of z ; b is the tangent of the angle formed by the trace of the line on the yz plane with the axis of z ; α is the intercept of the line on the x axis; β is the intercept on the y axis. In Fig. 3, AC is the trace of the line on the xz plane; $A'C'$ is the trace of the line on the yz plane; $a = \tan$ angle ADZ ; $b = \tan$ angle $A'D'Z$; $OC = \alpha$; $OC' = \beta$.

The equations of a line passing through the origin are given by making α and β each equal to zero, and are

$$x = az$$

$$y = bz$$

The conditions of perpendicularity between a line and a plane are

$$\frac{A}{C} = a \quad (7)$$

$$\frac{B}{C} = b \quad (8)$$

The values of the cosines which a line through the origin makes with each of the co-ordinate axes is (by theorem in Geometry), λ being the angle which it makes with the x -axis, μ the angle made with the y -axis, and ν the angle made with the z -axis,

$$\cos \lambda = \frac{a}{\sqrt{1 + a^2 + b^2}}$$

$$\cos \mu = \frac{b}{\sqrt{1 + a^2 + b^2}}$$

$$\cos \nu = \frac{1}{\sqrt{1 + a^2 + b^2}}$$

or,

$$\cos^2 \lambda + \cos^2 \mu + \cos^2 \nu = 1$$

Substituting in these equations the values of a and b from equations (7) and (8) we have

$$\begin{aligned} \cos \lambda &= \frac{\frac{A}{C}}{\sqrt{1 + \frac{A^2}{C^2} + \frac{B^2}{C^2}}} = \frac{\frac{A}{C}}{\sqrt{\frac{A^2 + B^2 + C^2}{C^2}}} = \frac{\frac{A}{C}}{\frac{1}{C}\sqrt{A^2 + B^2 + C^2}} \\ &= \frac{A}{\sqrt{A^2 + B^2 + C^2}} \end{aligned} \quad (9)$$

Similarly,

$$\cos \mu = \frac{B}{\sqrt{A^2 + B^2 + C^2}} \quad (10)$$

$$\cos \nu = \frac{C}{\sqrt{A^2 + B^2 + C^2}} \quad (11)$$

Now to find the axis of rotation of any muscle, having given the co-ordinates of the muscle contact-point (insertion) on the globe, and those of the origin of the muscle, we substitute these values in equation (6), which is the general equation of the plane passing through the origin and the two points x', y', z' , and x'', y'', z'' . We then have the values of the coefficients A, B, and C. Substituting these values in equations (9), (10), and (11), and solving, we get the values of the angles λ , μ , and ν , which are the results sought.¹

Calculating in this way the axes of rotation of the several muscles from the data furnished by Fick, Ruete, and Volkmann as given in the table above, we get the following table, which is, I think, free from any material errors except such as are contained in the original observations, which we cannot eliminate.

FICK. TABLE OF RE-CALCULATED VALUES.

MUSCLE.	Angle λ	Angle μ	Angle ν
Rectus externus.....	95° 29'	96° 19'	8° 23'
Rectus internus.....	94° 59'	85° 1'	173° 22'
Rectus superior.....	149° 58'	112° 12'	109° 9'
Rectus inferior.....	38° 4'	61° 56'	114° 7'
Obliq. superior.....	60° 37'	150° 36'	89° 26'
Obliq. inferior.....	Owing to error in co-ordinates, not re-calculated.		

¹ Dr. A. Duane, who has kindly looked over the above demonstration, suggests that "it is not quite fair to assume from Eq. 6, that because identical in form with Eq. 1, $y'' z' - y' z'' = A$. As a matter of fact, it may be any multiple of A. A better form of demonstration would be to substitute in Eq. 9, the values of $\frac{A}{C}$ and $\frac{B}{C}$ and then reduce. To avoid troublesome calculation the quantities $y'' z' - y' z''$, $x'' y' - x' y''$, and $x'' z' - x' z''$ may be denoted by d , f , and e respectively; d , f , e being either equal to A, B, and C, or to equal multiples of these coefficients. Then Eq. 9 reduces to

$$\cos \lambda = \frac{d}{\sqrt{d^2 + e^2 + f^2}} \text{ etc.}''$$

RUETE. RE-CALCULATED VALUES.

ORIGINAL VALUES. (*L. c.* p. 36.)

MUSCLE.	Angle λ	Angle μ	Angle ν	Angle λ	Angle μ	Angle ν
Rectus externus....	90°	90°	0°	90°	90°	0°
Rectus internus....	90°	90°	180°	90°	90°	180°
Rectus superior....	160° 43'	108° 25'	90° 34'	161° 30'	109° 30'	90°
Rectus inferior....	18° 51'	71° 13'	91° 17'	19°	71°	90°
Obliquus superior...	51° 3'	140° 29'	84° 30'	51°	141°	84° 30'
Obliquus inferior...	126° 52'	38° 52'	90° 14'	127°	37°	90°

VOLKMANN. RE-CALCULATED VALUES.

ORIGINAL VALUES.
(Aubert, Graefe, Weiland, etc.)

MUSCLE.	Angle λ	Angle μ	Angle ν	Angle λ	Angle μ	Angle ν
Rectus externus....	90° 52'	91° 20'	1° 24'	90° 52'	91° 20'	1° 25'
Rectus internus....	90° 42'	89° 15'	178° 59'	90° 41'	89° 15'	178° 59'
Rectus superior....	150° 4'	113° 47'	107° 5'	150° 5'	113° 47'	107° 5'
Rectus inferior....	31° 8'	65° 59'	108° 24'	31° 53'	66°	108° 34'
Obliquus superior...	55° 12'	143° 27'	80° 10'	53° 48'	146° 42'	79° 15'
Obliquus inferior...	129° 13'	39° 55'	96° 14'	129° 13'	39° 54'	96° 14'

In order to compare the tables of Fick and Ruete with that of Volkmann, the origin of co-ordinates would have to be moved to the centre of motion and the angles recalculated. The corrections thus obtained, however, would not be very great. If Volkmann's results could be re-calculated from his original notes and such errors eliminated as have been mentioned above, further changes would appear. An accurate knowledge of the muscle-planes and axes of rotation is at least one step toward a more perfect understanding of the motor functions of the eye, and although the practical utility of such knowledge is not immediately evident, there can be no doubt of its ultimate usefulness. Further original investigations in this field would seem to promise abundant reward.

THE THEORY OF ACCOMMODATION.

BY W. N. SUTER, M.D., WASHINGTON, D. C.

(With three text-illustrations.)

HELMHOLTZ'S theory of accommodation, the correctness of which has been denied by Tscherning,¹ Schoen,² and others, has been ably defended by Hess³ in a series of publications. Hess in his argument confines himself to the establishment of the fact that the ligament of the lens is relaxed in accommodation, whereas in the opposing theories it is claimed that the increase of curvature of the lens occurs as the result of increased tension of this ligament.

Notwithstanding the convincing demonstrations of Hess, there are many who still look with favor upon Tscherning's theory, believing that it offers a more rational explanation of accommodation than does that of Helmholtz. In several of the most recent text-books preference is given to Tscherning's theory. Tscherning himself, writing in the *Ophthalmic Review* (April, 1899), says: "The hypothesis of Helmholtz still finds defenders, especially in Germany . . ."

It is not my intention to enter upon a thorough discussion of this question, but briefly to mention one or two matters which, it seems to me, have not attracted sufficient attention.

After presenting certain theoretical reasons for discarding Helmholtz's theory, Tscherning proceeds to adduce experimental facts in support of his own theory. Having removed the lens and its ligament from the eye of an ox (probably

¹ *Archives de Physiologie*, 1894 and 1895.

² *Archiv für die ges. Physiologie*, 59, page 427.

³ *Archiv für Ophthalmologie*, 42, 1, and 42, 3, and *Bericht über die xxv. Versammlung der Ophthal. Gesellschaft*, Heidelberg, 1896.

of doubtful age), he finds that stretching the ligament by means of forceps causes an increase of curvature of the surfaces of the lens, especially of the anterior surface. This increase of curvature is confined to the summit of the surfaces, which change from approximate ellipsoids to hyperboloids. Crzellitzer repeated this experiment and confirmed Tscherning's result.¹ Later, for the purpose of accurate measurement, Crzellitzer devised an apparatus so that traction could be made simultaneously in twelve meridians, thus approximating very nearly the mode of action of the ciliary muscle. Measuring the curvature by means of an ophthalmometer, he found, likewise, an increase of curvature during traction.²

Crzellitzer does not mention the age of the animals from which the lenses were taken in these experiments. If one wishes to study the action of the crystalline lens in accommodation, it would seem proper to select the eyes of young animals, and especially important would this seem in the case of animals which (as the ox) have only slight accommodative power. It being impossible to procure fresh healthy human eyes, I procured a number (12) of calves' eyes. In none of them did traction on the lens produce the change described by Tscherning and Crzellitzer. The flattening of the surfaces, especially of the anterior surface, was marked. This is apparent from Figure 1, in which (a) is a profile photograph of a lens suspended in air without traction, and (b) is a similar photograph of the same lens under traction. The anterior surface is in each case on the left of the figure.* Enlarging these views by means of a stereopticon, I traced the curvature in each case, thus demonstrating indisputably that there is no increase of curvature at the summit of the stretched lens.

I next secured a number of eyes (8) from freshly killed beeves, all being more than five years of age. The alteration in curvature produced by traction on the lenses of these

¹ *Archiv für Ophthalmologie*, xlii., 4.

² *Bericht über die xxv. Versammlung der Ophthal. Gesellschaft*, Heidelberg, 1896.

³ For these photographs I am indebted to the kindness of Prof. B. B. Brackett, Ph.D., Instructor in Physics, Eastern High School, Washington, D. C.

41



a



b

FIG. 1.



a



b

FIG. 2.

eyes was essentially different from that which occurred in the lenses of the calves' eyes. The flattening of the anterior surface was absent, and when sufficient traction was made, one or both surfaces assumed an unmistakably hyperbolic form. It usually happened that an increase of curvature at the anterior surface was accompanied by a diminution of curvature of the posterior surface.

The characteristic hyperbolic curvature is shown in Figure 2, in which (a) is a photograph of the unstretched lens of a superannuated cow (said by the butcher to be twelve years old), and (b) is a photograph of the same lens under traction.

Dissection of these lenses reveals the cause of their different behavior under traction. The calves' lenses have no hard nucleus, while those from the full-grown animals have a nucleus of pronounced hardness surrounded by a comparatively soft cortical layer. In the lens shown in Figure 2 this formation was especially characteristic. Pressure upon the lens with the fingers gave the impression of a soft, gelatinous mass surrounding a nucleus of stony hardness. When the capsule was ruptured the cortical matter was easily removed, leaving the solid nucleus exposed. No amount of pressure less than that which crushed the nucleus (and great force was required to do this) produced any appreciable change in shape.

In other words, that condition which is most favorable and which, in fact, is indispensable, according to Tscherning's theory, for the accomplishment of accommodation, is the one which is known to offer the greatest obstacle to accommodation in the human eye; for the greatest power of accommodation exists in childhood when the lens is soft throughout, and this power diminishes as the nuclear portion of the lens becomes harder with increase of age.

Figure 3 (a) represents the manner in which accommodation is accomplished according to Tscherning. The hard nucleus resists change in shape, and tension of the ligament forces aside the soft cortex, leaving the greater curvature of the nucleus exposed. If this actually occurred in nature, it would inevitably happen that in young persons in whom

the nucleus is still pliable, accommodation, if it could be accomplished at all, could not be maintained for any length of time, since a long-continued pressure would flatten the nuclear portion of the lens, as is illustrated in Figure 3 (b).

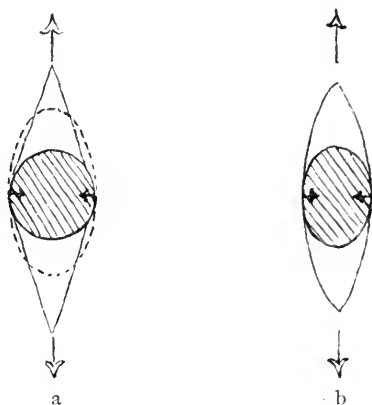


FIG. 3.

But Czermak has by another method attempted to show that the lenses of *calves'* eyes assume an increased curvature during traction.¹ Having excised the cornea, he measured the curvature of the anterior surface of the lens with an ophthalmometer, and then injected fluid into the vitreous chamber, when upon remeasurement, he found an increase of curvature. This is doubtless true, but it bears no resemblance to the process of accommodation in nature. An increase of fluid in the vitreous chamber would certainly push forward the lens, increasing the curvature of the anterior surface, but at the same time it would diminish the curvature of the posterior surface, which was not subjected to measurement. This objection applies also to Schöen's theory of accommodation.

Helmholtz's theory, if rightly conceived, affords a rational and ample explanation of the phenomena of accommodation, but it has suffered much from the misunderstanding of writers on physiology and ophthalmology, many of whom

¹ Bericht über die xxv. Versammlung der Ophthal. Gesellschaft, Heidelberg, 1896.

have supposed that the semi-fluid substance of the lens possesses elasticity, as does a coil of steel wire or a watch spring, to which the fibres of the lens have not infrequently been compared.¹ In the ideal state, as regards accommodation, the crystalline lens is comparable to a thin india-rubber bag filled with water or other fluid substance. The more nearly the lens approximates this ideal condition, the greater is the accommodative power, although in reality the substance of the lens is never perfectly fluid.

That the capsule of the lens possesses contractile elasticity is easily proved by raising a fold of it with forceps (taking care not to rupture it); when released, the capsule at once contracts firmly upon the surface of the lens. Furthermore, anatomists have shown that the structure of the capsule is similar to that of sarcolemma, an essentially contractile substance.

A fluid or gelatinous substance enclosed in a contractile envelope would necessarily assume a spherical form if not prevented by some counteracting force. This is because a fixed volume of substance presents the smallest possible surface when it is in the spherical form. In conformity with this fact a drop of oil in water, with which the oil is not miscible, always assumes the spherical form, but in this case there is no external envelope; the spherical shape is due to the external pressure of the surrounding water. With the crystalline lens there is, in addition to the pressure of the aqueous and vitreous, the contractile force of the capsule, ever tending to reduce the surface to a minimum.

The spherical form is therefore that which the lens would assume if it were not prevented by traction of the ligament, and to this form it tends when released from this traction, unless it has become hardened in its flattened state.

¹ Schweigger also has called attention to this erroneous conception. See ARCHIVES OF OPHTHALMOLOGY, 1897, page 584.

ON STRICTLY SIMPLE EVISCERATION OF THE EYE-BALL.

BY DR. H. GIFFORD, OMAHA, NEB.

WHAT is generally called simple evisceration is really an evisceration plus a keratectomy. For more than two years I have been doing a strictly simple evisceration, that is, instead of cutting out the cornea I have made a meridional incision either entirely within the sclera or extending partly or entirely across the cornea, and have completed the evisceration through the opening thus made without removing any of the cornea. The results have convinced me that this should be the operation of election. Thus far I have done fourteen simple eviscerations.

My first operations were done as follows: A conjunctival flap was laid back by two incisions, one along the corneal margin from near the insertion of the external rectus to that of the superior rectus, the other extending from the lower extremity of this incision obliquely up and back to the retro-tarsal fold. A meridional incision $\frac{3}{4}$ inch long was then made through the sclera midway between the external and superior recti, extending from within 3 *mm* of the corneal margin toward the posterior pole of the eye; the eye being then turned down, the contents of the globe were scraped out through this incision, which was held apart with hooks or forceps. The conjunctival flap was then replaced by two or three sutures, no scleral sutures being employed. The advantages of this operation were that, although the stump gradually diminished in size until the cornea was reduced to a mere facet, on the average a much larger stump was finally obtained than where an evisceration plus a kera-

tectomy without the introduction of any foreign body is done. My experience with the ordinary (*i. e.*, the non-simple) evisceration has been that while in the great majority of cases the stump shrinks so as to be little if any better than that obtained by enucleation, occasionally, owing to unknown conditions, an unusually large stump remains. With the simple evisceration just described these large stumps are the rule. Another advantage of the simple operation is a reduction of the conjunctival œdema which is so frequently an unpleasant feature of the current operation. After a simple evisceration there is in most cases no chemosis worth mentioning, and while in two or three cases there has been sufficient for a fold of conjunctiva to show between the lids, it has never reached the proportions formerly seen by me and so frequently described by others. This diminution in the chemosis I attribute to the non-interference with the terminal loops of the vessels supplying the cornea, which corresponds with the theory which I first heard advanced by Dr. Risley of Philadelphia, to the effect that the œdema following the ordinary evisceration was, to a large extent, not inflammatory but rather the result of cutting off the terminal loops of the circumcorneal vessels, while their main trunks remained undisturbed. The disadvantage of the operation is that it is more difficult to remove the contents thoroughly and to obtain a view of the interior than where the cornea is cut out. To obviate this difficulty, I have in the last seven operations modified the incision in various ways. The incision has either been carried clear across the centre of the cornea and $\frac{1}{8}$ inch into the sclera on either side and after evisceration no suture introduced; or the incision extended from the centre of the cornea back as far into the sclera as might be required, a single conjunctival suture at the edge of the cornea being put in; or a scleral flap was made with one branch of the incision partly surrounding the cornea at a short distance back of it, the other a meridional scleral incision, scleral and conjunctival sutures being introduced. In two cases where scleral and conjunctival incisions were made, the edges were held in more or less complete apposition by the application

of the ordinary purse-string conjunctival suture. I have seen no great difference in the results obtained by these various methods and a larger experience must determine whether any one of them should have the preference. The important point is that, in all, the cornea is retained.

The same principle has been applied to extensive wounds of the eye requiring evisceration. I have completed the operation through the wound or an enlargement of it without cutting out any of the cornea and generally without introducing any sutures. The stump obtained has been as good, on the average, as in those cases where the site of the incision could be chosen. In dressing all of these cases after irrigating the cavity and the conjunctival sac thoroughly, a piece of freshly sprinkled iodoform gauze has been applied over the wound beneath the lids. Where no sutures have been put in I have partially collapsed the ball by putting enough gauze beneath the lids to push back the front of the globe to some extent, the idea being that unless the edges of the wound can be closely approximated or protected by conjunctiva it is better to allow free exit for the fluids collecting within the globe. The gauze is removed after two or three days, and in all cases hot applications are made for $\frac{1}{2}$ hour two or three times a day from the second to the sixth or eighth day.

I was at first in hopes that the simple evisceration would always give so large a stump that the bother of introducing one kind of foreign body or another into the globe would be entirely done away with, but while in at least half of the cases the stump has left nothing to be desired, in the others a firmly healed-in artificial vitreous would undoubtedly give an improvement. So far, after doing the simple evisceration I have introduced foreign bodies in only three cases. In two of these a perforated bone shell was used ; in the other, a glass ball. In all three cases the reaction was astonishingly slight, no œdema and almost no pain occurring. Nothing has been seen or heard of these foreign bodies so far, but as none of them has been in longer than six months it is not yet certain that they may not be expelled. Theoretically it seems quite certain that an artificial

vitreous of a given size has a better chance of being retained if the cornea is left than if it is cut out. The expulsion of the artificial vitreous which so frequently occurs when the ordinary evisceration is done, is due to the inevitable shrinking of the sclera pulling on the edges of the wound before the scar is thoroughly organized. The simple evisceration tends to avoid the bursting open of the wound; first, by permitting incisions which can be more accurately coapted than where a keratectomy is done; secondly, and more important still, it leaves so much more space within the globe that there is more time for the scar to organize before the contraction of the sclera begins to stretch it over the artificial vitreous.

Since beginning this article I have come across a statement made in the Ophthalmological Society at Paris by Chevallereau (*Rec. d' Ophthalmologie*, April, 1900, p. 210) that he has tried a simple evisceration, but has abandoned it on account of the small stump obtained; an experience which is entirely contrary to my own.

REPORT OF THE SECTION OF OPHTHALMOLOGY
AND OTOTOLOGY OF THE NEW YORK ACADEMY
OF MEDICINE.

OPHTHALMOLOGICAL PART.

MEETING OF FEBRUARY 16, 1900.

By Dr. ARNOLD KNAPP, Acting Secretary.

I. Presentation of Cases.

Dr. ARNOLD KNAPP presented a patient from whom he had removed an orbital tumor, a **cavernous angioma**, by Krönlein's method, with preservation of the eyeball and restoration of sight. (Published in these ARCHIVES, vol. xxix., No. 2.)

Dr. J. A. MEEK showed a patient, twenty-two years old, from whose cornea he had removed a small piece of iron which had remained there for four years. The iron particle measured $3\frac{1}{2}$ by $2\frac{1}{2}$ mm, situated in the substance of the cornea, and appeared like a phlyctenule with a leash of blood-vessels.

Dr. CALLAN had observed a farmer with a phlyctenule-like body in the cornea which contained a husk of grain and had existed for six months.

Dr. W. B. JOHNSON, in excising a prolapse of iris four months after injury, found it to contain a very small fragment of stone.

Dr. S. M. PAYNE exhibited a patient where three tenotomies had been done three years previously ; for the resulting divergence he practised advancement of one int. rectus without tenotomy of the antagonist, by first passing a double-needed thread through the sclera near the limbus, then passing each extremity of the thread through the cut tendon and tying the two ends over the tendon, producing slight convergence. The present position is excellent.

Dr. WEBSTER thought the operation good and simple, and described his own method for advancement.

Dr. VALK considered catgut to be better than silk.

Dr. JOHNSON stated, apropos of the absorption of catgut after eye operations, that in one of his cases the catgut remained four years after an operation of enucleation.

II. Dr. J. WOLFF then read the paper of the evening on **the occurrence of retraction movements of the eyeball together with congenital defects in the external ocular muscles**. Illustrated by three patients and a model. (Published in these ARCHIVES, vol. xxix., No. 3.)

Dr. A. S. ALLING had observed a similar case where the left eye was retracted. Tenotomy of the int. rectus was done to reduce the retraction and lateral position of the head. The int. rectus was found strong and healthy. The ext. rectus was cut down upon; the resisting band could not be moved. (Published in these ARCHIVES, vol. xxix., No. 3.)

MEETING OF MARCH 19, 1900.

By Dr. J. H. CLAIBORNE, Secretary.

Dr. W. B. JOHNSON reported a case in which a portion of a copper-cap had been removed from the eyeball. The patient, a boy, sixteen years old, had been injured by the explosion of a dynamite cartridge, March 7, 1897. Each cornea was perforated, and traumatic cataract developed in each eye, followed subsequently by absorption of the lens. About a year later, the vision in the right eye was: fingers at two feet with correction; in the left, $\frac{2}{4}$. He was able to attend to his business until January, 1899, when on sliding down a rope, head downwards, a piece of copper, about $\frac{1}{8} \times \frac{1}{8}$ of an inch, was thrown from the vitreous into the anterior chamber, and was removed through an incision, with forceps. When the case was demonstrated, the patient's vision was R $\frac{1}{200}$, L $\frac{2}{4}$. With appropriate glasses he could read Jaeger No. 1 at 12 inches; has had no discomfort for several months.

Dr. J. H. CLAIBORNE demonstrated for Dr. POOLEY, absent, a case showing the result of an operation for the removal of lens in the anterior chamber. The man had been struck by a piece of wood, and the lens dislocated into the anterior chamber. The following day he was operated upon by Dr. Pooley; the cornea

incision was below, the knife being thrust partly through the lens. The wound healed kindly, and at first there was a white clear pupil in the shape of a horizontal slit. Subsequently, the upper portion of the iris was dragged downward, and when the case was presented the pupil was extremely narrow. There was an anterior synechia below.

Dr. J. H. CLAIBORNE presented a case of dislocation of the lens into the vitreous chamber, caused by a blow with a piece of asphalt eight months before. The lens was dislocated backward, apparently still attached by a portion of the zonule of Zinn. The vitreous humor was perfectly clear, and the vision was $\frac{2}{3}$. Dr. Claiborne thought the case presented the conditions as brought about by a classical couching.

Dr. T. R. CHAMBERS had a case in which there had been exophthalmos of the left eye. At first, the vision was good in both eyes, and there were no fundus changes. In a month the left eye became blind. There was marked optic neuritis. Krönlein's operation (temporary resection of the outer wall) was performed, so that the little finger could be pushed into the orbit behind the eye. There a tumor was found which surrounded the optic nerve, and apparently extruded from the optic foramen. The tumor was excised close to the foramen, with the optic nerve, the nerve being cut close to the eyeball. The eye was very hard, and had a fully dilated pupil. The globe was eviscerated, and a glass ball inserted. The displaced bone was readily replaced, and the periosteum united.

Dr. WARD A. HOLDEN diagnosed the tumor as a fibro-sarcoma of the sheath of the optic nerve, with a tendency to myxomatous degeneration. The tumor removed from the foramen was found to be a soft fibroma, with no tendency to myxomatous degeneration; the examination of this part of the tumor being made by Dr. J. H. McLaughlin, of Jersey City.

Dr. W. H. BATES showed a case of convergent strabismus, three years after operation. He called attention to the following points: The case was cured by one operation. There was binocular single vision for distance and for near. The effect was permanent. Before the operation, the rotation of each eye inward was 65° , outward, 39° . After the operation, three years later, rotation was 40° inward and 40° outward.

In the discussion, Dr. DUANE said he thought the result good. There was something to be said in favor of a bilateral operation.

He thought there was a fallacy in the practice of operating on one eye, and subsequently upon the other. He thought the results were better when both were operated upon at once.

Dr. WEEKS thought the inward movement of the eye was limited. He would advise the advancement of the external, with slight tenotomy of the internal, rectus.

Dr. H. KNAPP made some remarks on **thrombosis of the cavernous sinus**, based on a case still under treatment. Non-infective thrombosis of the cavernous sinus is very rare; this was the only case he had seen. The patient was a healthy man of thirty-three; he had been struck over the left eye in the supra-orbital region by the butt end of a billiard cue. It seemed to give him no trouble until a week afterwards, when the eye protruded. This increased. Dr. Knapp found ptosis and exophthalmos, and chemosis which projected beyond the lids. The patient had headache and was drowsy. The third nerve was paralyzed, but the sixth was intact. The vision was diminished. There was neuro-retinitis, œdema of the retina, and the veins were large. Pressure on the eyeball produced pulsation in the arteries and veins. There was considerable hardness to the outer side of the orbit. He was in some doubt as to the cause of these symptoms. He thought there was a fissure in the upper wall of the orbit produced by injury. The exophthalmos might be produced by traumatic hematoma, or by a sarcoma, which was also traumatic in origin. He made no incision, for obvious reasons: if it were sarcoma, its growth would be hurried; if simply serum and a blood clot, the case might be complicated by infection. The vision continued to diminish, and the neuro-retinitis increased. The visual field was normal, and there was an ulcer of the cornea. The third, fourth, and sixth nerves were then paralyzed, and there was anæsthesia of the first division of the fifth pair. He concluded that all the nerves passing through the cavernous sinus were now affected. As thrombosis in one cavernous sinus was nearly always transmitted to the other, he therefore entertained the idea that the right (good) eye might be affected. In that case he would try to have the clot removed from the cavernous sinus. All cases on record, thus far, had become blind by thrombosis of the cavernous sinus of the second eye. After some hesitation, Dr. Hartley consented to operate for him. A bone flap was made before and above the ear, with a base of about $2\frac{1}{2}$ inches. The meninges, on being exposed, were found to be normal. The brain was

raised and the cavernous sinus incised. Its walls were unevenly thickened by stratified deposits, encircling two blood clots, which were taken out. The circular sinus and the superior petrosal sinuses were probed until blood flowed out, and then tamponed. The wound was dressed. The patient had no headache or fever. The formerly unaffected eye was sound at the time of speaking. The tumor is still growing, and if a traumatic sarcoma, inoperable.¹

Dr. WEEKS wished to know how long after the injury the tumor appeared. Dr. Knapp replied : Six or seven weeks.

Dr. CALLAN said he had removed a sarcoma of the orbit, but it had recurred.

Dr. WEEKS thought the growth had developed very rapidly. He referred to a case of traumatic sarcoma that had lasted nine years.

Dr. KNAPP also referred to two cases which terminated fatally in six to eight months.

Dr. JOHNSON referred to a child with sarcoma of the right orbit following an injury. The patient recovered from the operation, and the wound healed. The sarcoma recurred and the child died. He thought all of them died. He suggested the trying of the erysipelas-toxin treatment in these cases.

Dr. DUANE read a paper on the **After-treatment of tenotomy**. He expressed a decided preference for the plan of leaving the eyes open from the moment of the operation, and encouraging the patient to begin using them at once in binocular fixation. The principle underlying this plan is that the eyes have a strong natural tendency to assume their natural relations to each other, when allowed to do so. This tendency to spontaneous restitution is fostered, not only by making the patient use his eyes for distant vision, but also by suitable exercises. The tendency is greater in proportion to : first, the degree of binocular vision present ; second, the facility with which the patient can perform the various movements ; third, the closeness with which the result produced by the operation approximates to the correction. The plan of treatment is as follows :

First, the patient is trained before the operation in the use of the eye muscles.

Secondly, the operation is checked repeatedly during its per-

¹ The tumor was a small-celled sarcoma. The patient died. The case will be published in full in these ARCHIVES. H. K.

formance, and immediately afterward, by accurate quantitative tests, and is proceeded with until just the desired result is reached. The patient is made to use his eyes systematically for distant vision directly after the operation. If the post-operative deviation, whether under- or over-correction, is large, attempts are made to reduce it by a systematic daily exercise of the convergent, divergent, and lateral movements, with prisms or other means.

The duration of the treatment varies greatly, but, as a rule, may be stated to be about two weeks, although it is desirable to keep the patient under supervision for a month or more.

There were several objections which had been raised, but he said that the plan recommended had been employed by him with satisfaction, either in its entirety or in part, for a space covering fifteen years. Indeed, so convinced was he of the value of this after-treatment, that he had come to regard the technique of the operation as of subsidiary importance. If the plan he suggested was followed carefully, it seemed to him to make little difference how the operation was done, but it made a great difference how it was treated afterwards.

Dr. WEEKS saw no necessity for making a fast rule for leaving off the bandage. The condition of the eye after the operation should settle that question. He thought that when the operation resulted in an under-correction, the muscles might remedy the condition somewhat. It is his custom to keep on the bandage for twenty-four hours.

Dr. KNAPP said he considered the manner and effect of the operation of paramount importance. He believed that an under-effect could and should be corrected, immediately or in the next days, in order to avoid unpleasant after-operations.

In closing the discussion, Dr. DUANE, in answering Dr. Knapp, said he did not intend to undervalue the necessity of a good technique, but he wished to emphasize his belief, that the operation, however well done, produces at best only an approximate correction, and that the directive force of the eyes themselves, supplemented by exercises, is of prime importance in converting this approximation into precise correction.

MEETING OF APRIL 16, 1900.

By Dr. J. H. CLAIBORNE, Secretary.

Dr. JULIUS WOLFF presented an **iridectome**, an instrument which he devised for the performance of iridectomy, and which

combines scissors and forceps in one instrument. It consists essentially of a pair of Weiss's iridectomy scissors, at the top of which is attached the upper end of a slender rod which can be adjusted upwards and downwards. At the lower end of this rod two pieces of steel cross in a joint, their lower ends being shaped like the points of iris forceps, and the upper ends consisting of plain steel springs which press against the inner surfaces of the branches of the scissors. When the instrument is relaxed the tops of the forceps stand about 3 *mm* apart and are below the blades of the scissors, allowing their introduction into the anterior chamber. Dr. Wolff said that the advantages over the separate forceps and scissors lay in the fact that one hand of the operator was left free so that there was no need of an assistant, and that one hand less is required in the field of the operation. Also the interval between the catching and cutting of the iris is shortened, since the scissors are already in place when the iris is grasped. Dr. Wolff has demonstrated to his satisfaction the practical value of the instrument in several cases. The instrument was made by Tiemann.

Dr. WEEKS thought the instrument ingenious but faulty. The cutting should be done in the same plane as the iris. He thought the separate use of forceps and scissors better.

Dr. CHAMBERS thought the instrument faulty because it limited the amount of iris to be cut.

Dr. JNO. E. WEEKS showed a patient illustrating the result of an operation for **entropion** by transplanting a section of mucous membrane from the lips into the incision. The result was excellent.

Dr. CARL KOLLER wished to know how the operation was performed.

Dr. WEEKS described it on the black-board.

Dr. TANSLEY wished to know what Dr. Weeks hoped to gain by his method beyond relieving the entropion.

Dr. WEEKS said it increased the breadth of the lid.

The paper of the evening was read by Dr. W. A. HOLDEN, on the **order of development of color perception and color preference in the child**. (Published in these ARCHIVES, vol. xxix., No. 3.)

The paper was of such a nature that it is difficult to give a résumé of it. It contained the results of observations made by Mr. Bosse and himself on a large number of children. In general it appeared that infants from six to fifteen months of age have

a lively appreciation of color, and select colored ribbons, as a rule, closely in the order of the spectrum, beginning at the red end. At the age of two to three years, an indifference to colors becomes manifest, and, as appreciation returns later, the children select the colors, as a rule, in the reverse order of the spectrum, beginning at the blue end. At the age of eight, blue preference is almost universal.

Dr. BULL said his observations in this matter had been somewhat along the same lines. He had made some experiments with his own boys. At the seaside one of his boys expressed himself as being dead tired of yellow, the prevailing color in that region.

Dr. LESZYNSKY had found that red was irritating to children, but did n't know why. He thought it a good idea to keep red away from them and to color toys blue rather than red, as is the rule.

Dr. SEABROOKE also discussed the paper.

Dr. CLAIBORNE said he thought the subject most interesting but speculative.

He doubted if any definite scientific deductions could be drawn from the observations made. Many of the children were too young for any reliance to be put upon their selections of the colors. He thought chance might direct choice as easily as selective instincts. He referred to a case of a young woman blind since two weeks after birth, in whom the sensation of red aroused unpleasant ideas, blue agreeable ones, and green none at all.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM, FRIDAY, JULY 6, 1900.

By Mr. C. DEVEREUX MARSHALL.

G. ANDERSON CRITCHETT,
M.A., F.R.C.S.E., PRESIDENT, IN THE CHAIR.

Mr. F. M. OGILVIE read a paper on one of the results of concussion injuries of the eye—"holes" at the macula. He had collected all the published cases presenting this lesion, and he divided them into two large classes: (*a*) those in which there was no detachment of the retina, and (*b*) those in which detachment was present. He showed lantern slides of the appearances of the fundi in all these cases, which invariably followed concussion injuries, such as blows from blunt objects, or from stones thrown from catapults, while one most interesting case he had previously shown to the Society in which the injury was due to a bullet which apparently hit the back of the eye in passing through the orbit. He advanced several theories to account for the holes, which, as a rule, were about $1\frac{1}{2}$ diopter in depth. There was in nearly all cases a scotoma corresponding to the hole. He summarized the conditions brought about as follows: (1) The lesions are definite and central; (2) they are the direct result of violence; (3) the injuries are permanent; (4) the general disturbance of vision is not great; (5) they are the result of concussion injuries only.

Mr. ADAMS FROST endorsed all that Mr. Ogilvie had said regarding the appearance of the lesion, and in view of the fact that no case had as yet been examined pathologically he suggested that possibly a similar condition might be brought about by a like injury in the eyes of animals or in eyes recently excised.

Mr. C. DEVEREUX MARSHALL read some further notes of a

case of optic-nerve tumor reported to the Society in November, 1899. The patient was a woman, aged forty-six, upon whom he operated at the request of Mr. Poulett Wells on November 30, 1897, when the contents of the orbit were thoroughly removed. She remained in very fair health until shortly before her death, which took place on May 4, 1900 (two and one half years later). Owing to the kindness of Mr. Austin Reynolds, who attended her up to the time of her death, which occurred very suddenly, Mr. Devereux Marshall was enabled to obtain a *post-mortem* examination. The necropsy was made on May 6th, and the following was the condition found :

On removing the calvaria the middle meningeal vessels were found to be distended, and the Pacchionian bodies very large. The cerebral convolutions were very much flattened. The optic chiasma had entirely disappeared and its place was occupied by a large diffuse and very soft tumor, about the size of a bantam's egg. So soft was it that its actual limits could not be defined and the greater part of it could easily have been washed away with a moderately strong stream of water. The centre of the growth was the right optic tract, and it spread along the chiasma, involving the optic tract and optic nerve on the left side, both of which were considerably enlarged. The tumor reached the pons on both sides, invaded the lateral and third ventricles, and on the left side the optic thalamus and corpus striatum. The growth was so very diffuse that it appeared that the third, fourth, fifth, and sixth nerves on both sides were more or less included in it. On both sides the under surfaces of the temporo-sphenoidal lobes were invaded. The tumor was still further broken down by recent hemorrhage in the vicinity of the left optic tract. No separate deposits were found in the brain, and the growth had evidently spread by continuity only. In the thorax nothing abnormal was found, except that the mitral valve was very much thickened. In the liver a few cysts were found containing clear fluid, but the liver was otherwise healthy, and there was no sign whatever of any new growth. The spleen, pancreas, and uterus were free from disease, but the kidneys were slightly granular, and the capsule tore the kidney tissue in separating. The aorta was somewhat atheromatous. The microscopical appearance of the growth closely resembled those of the original nerve tumor. The main substance of it was made up of a network of irregular branching cells, in which were small spaces, mostly circular, similar to those described

as being present in the original nerve tumor, and which were thought to be channels from which the nerve fibres had disappeared. Seeing that this also was a growth mainly involving the medullated nerve structures, probably the same explanation of the spaces held good. Here and there in the growths were strands of a dense fibrous tissue in which blood-vessels were seen in section.

Briefly, the neoplasm seemed to be due to an immense overgrowth of the connective-tissue framework of the nerve, mainly the neuroglia, but also of the more fibrous prolongations from the pial sheath. The optic nerve on the opposite side was much enlarged, and on examining it microscopically the sections were seen to present precisely similar appearances to those of the right nerve which was described in the first paper. Mr. Devereux Marshall added that in the last volume of the *Transactions* would be found a paper by Buller and himself, the basis of which was a case of optic-nerve tumor somewhat similar to the one described that evening, and at the present time (three years after removal) the patient was alive and well. In that paper the question of prognosis was fully discussed, and the conclusion arrived at from published cases was that the disease, although of not a very malignant type, could by no means be considered innocent, and it was advisable to remove it as thoroughly as possible. This remark was justified by the present case, in which, although the growth was removed as completely as possible, yet the nerve was affected farther back than the orbit, and this was of course the way by which the growth reached the brain.

Mr. PERCY FLEMMING read a paper on **three cases of ophthalmitis (pseudo-glioma)** in children.

Case I. recovered after a four months' illness, the main symptoms being irregular pyrexia, vomiting, head retraction, and diarrhoea. There was a history of convulsions and ear discharge, but no history of syphilis or acute specific fever. Case II. died with typical posterior basic meningitis and pus in right middle ear. (This patient had an attack of chicken-pox four weeks after the eye became affected.) Case III. died after an illness very similar to Case I., and *post-mortem* was found to have basic meningitis; middle ear healthy.

These cases, considered in relation with others published, might be taken to indicate that meningitis was the common cause of this particular form of ophthalmitis, and, further, that middle-ear disease was a likely cause of the meningitis. The following objec-

tions were urged against this view : (1) The fact that these cases in children rarely ended fatally ; (2) pseudo-glioma is a rare complication of posterior basic meningitis, as was also optic neuritis ; (3) the usual unilateral character of the affection. Mr. Flemming considered that the eye condition was part of a septicæmic or pyæmic process, which in most cases was limited to the eye, such cases recovering ; whilst in others the meninges might be affected by the same process, these cases terminating fatally. The otitis might be the starting-point of the infection, and in any case of ophthalmitis (pseudo-glioma) it was most important to have the ear examined, and even to puncture the membranes though apparently healthy.

A paper by Mr. KENNETH SCOTT and Mr. JOHN GRIFFITH was read on **a case of alveolar carcinoma of the eyelid**, which was removed from an Egyptian. The specimen on examination proved to be a carcinoma of the Meibomian glands.

CARD SPECIMENS.—The following were shown : Mr. E. W. Brewerton : Case of pseudo-glioma. Mr. W. T. Holmes Spicer : Sections of conjunctiva from a case of spring catarrh. Mr. W. H. Jessop : Tuberculous ulceration of the conjunctiva. Mr. W. Adams Frost : Peculiar crescentic opacities in the cornea. Mr. Treacher Collins : A case of congenital notch in each lower lid with defective development of the malar bones.

REPORT OF THE TRANSACTIONS OF THE AMERICAN
OPHTHALMOLOGICAL SOCIETY AT ITS ANNUAL
MEETING, HELD AT WASHINGTON, D.C., MAY 7
AND 8, 1900.¹

Dr. EDWIN E. JACK, of Boston, reported **a case of alexia, mind-blindness, etc., with autopsy.** The patient, a man sixty-three years of age, with negative history, began a month before consultation to lose power of reading labels, car signs, etc. There were the following symptoms, negative ones being added to complete the picture. Patient could hear sounds of all kinds and recognize them, could *understand* spoken words, could *see* letters, numbers, and words, printed and written, but could not, except to a slight and variable extent, understand them. He could at all times tell a few letters, figures, words, etc., but the power was soon exhausted. He could see objects but could name only a few. He could not when asked describe the schoolhouse across the way nor the former familiar streets around him. Inability to a considerable extent to tell the use of objects. He made queer mistakes, trying to drink out of the sugar-bowl and salt-cellar and trying to put his hat on over his arm like a coat. At times he did not recognize his wife. He could speak voluntarily fairly well. He could not read aloud nor write voluntarily except to a very slight extent. Power of writing to dictation almost wanting. Could not do transfer copying. He had amnesic color-blindness but not true color-blindness.

Up to ten days of death no hemianopsia or optic neuritis. No later observation made. There was a mitral regurgitant murmur and moderate arterial sclerosis. Clinical diagnosis,—Alexia and mind-blindness both partial and cortical, visual aphasia, and amnesic color-blindness. The lesion was thought to be softening, possibly

¹ The abstracts of the papers have been kindly furnished by the authors, for which the editors of these ARCHIVES express their thanks.

tumor, in the region of the angular gyrus and in the occipital lobe, probably sparing the region of cuneus and calcarine fissure. Patient died about two months after he was first seen.

The autopsy and pathological report were by Geo. Burgess Magrath of the Harvard Medical School. There was *softening of the lower middle third of the left temporal lobe*. Posterior to this dura thickened and adherent to brain for an area 4 by 5 cm. On section through this there was a mass (glioma) 4 cm in diameter extending backward to the anterior boundary of the left occipital lobe; forward from this posterior limit for 6 cm up to the level of the first temporal convolution, inward to the collateral fissure. It involved the 3d temporal convolution in posterior part and gyrus fusiformis. Anterior to the mass was an area of supposed softening extending into the substance of temporal lobe as far as the lateral plane of the anterior third of the pons, backward into the occipital lobe nearly to its posterior border. Sections by the writer showed the cuneus and calcarine fissure uninvolved. Floor and roof of left lateral ventricle softened, in places to the point of disappearance. The extension into the temporal and occipital lobes was found to be the same as the main mass, viz., glioma.

The pathological report and sections made showed that the angular gyrus was not directly involved, and it is supposed that the alexia symptoms were caused by the pressure, etc., of the tumor, its greatest development being in that region. The changes in the occipital lobe would account for the mind-blindness, etc.

Dr. G. C. HARLAN, in a paper on **distention of the accessory nasal sinuses involving the orbit**, referred to the difficulty often met with in the diagnosis of these conditions, and claimed that in a large proportion of cases they can be treated more successfully through the orbital walls than by way of the nasal fossa. Two cases were reported; one of a tumor of the orbital wall exactly resembling an ivory exostosis, due to empyema of the anterior ethmoidal cells, the result of an old fracture of the nose, and occurring in a healthy boy nine years of age; no necrosis or caries. The other of extensive exophthalmos resulting from empyema of the frontal sinus and ethmoidal cells, with necrosis of inner orbital wall, but no communication with the orbital cavity.

In each case the tumor was exposed by an incision curved along the margin of the orbit and side of nose, and the cavity was

freely opened through the orbital wall and drained and irrigated through the nose with a tube. The second case required extensive curetting of the diseased bone. Both made good recoveries without fistulæ and with scarcely perceptible scars.

The different methods of opening the frontal sinus were discussed and preference given to making the incision beneath the eyebrow (Jansen) and attacking the bone at the inner upper angle of the orbit.

Dr. SAMUEL THEOBALD, of Baltimore, reported a **case of spastic convergent strabismus** following influenza, in a child seven years of age. Though a recognized complication of hysteria, spastic squint, apart from this, is a rare anomaly, to which the text-books, as a rule, devote but scant attention. The attack of influenza during convalescence from which the squint manifested itself was characterized by severe and persistent headache and was complicated by an otitis media. The squint developed suddenly and was attended by annoying diplopia. Paralysis of the abducens was excluded. After persisting for nearly two weeks the deformity disappeared as suddenly as it had shown itself, the muscle balance becoming at once almost normal. At the time this occurred, the eyes were under atropia, which had been prescribed a week previously.

The squint, which was regarded as a purely spastic one, was attributed to an irritation, consequent upon the influenza, of the innervation centre which controls the associated action of the internal recti muscles. Reference was made to a similar case reported by Dr. Saml. S. Adams, of Washington, in the *Archives of Pediatrics* (vol. i., p. 634), in which the squint followed an attack of diphtheria.

LUCIEN HOWE, of Buffalo, N. Y., read a paper **concerning the measurement of relative accommodation and convergence**. An account was given of work already done in this department by MacGillvary with Donders and later by Nagel and Bisinger. As the difficulty in such measurements was principally because of the imperfection of the apparatus, an attempt was made by the writer to improve and simplify this. The form proposed is in general similar to a letter T. Standing upright on each side of the short arm of the T there is a series of small lenses similar to that in the Loring ophthalmoscope which can be passed in turn before the eye to be examined when the test is made for relative accommodation. When the test is made for relative convergence,

a pair of Risley's prisms is used instead of the ophthalmoscope glasses. The distance between either the prisms or lenses can be varied to correspond to the distance between the eyes in different individuals, and both prisms and lenses can be made to move before the eyes in an arc to correspond to varying degrees of convergence.

The demonstration of this instrument was accompanied by the demonstration of the head-rest especially adapted for it, of a simple form of the visuometer for measuring the distance between the centres of the eyes, and of a chart which showed the angles of convergence in individuals having a distance between the eyes ranging from 55 to 75 millimetres.

Dr. ROBERT SATTLER, of Cincinnati, read a paper on **lesions of the frontal sinus and anterior ethmoidal cells in infancy and old age**, of which the following is an abstract :

Lesions of the frontal sinus and adjacent cells of the ethmoidal labyrinth in the two extremes of life, infancy and old age, are of interest not only because of their rarity, but also by reason of the noteworthy differences that are observed in their course and clinical features.

In very young subjects the air-spaces of the frontal bone are absent or rudimentary, and the adjacent anterior ethmoidal cells are also imperfectly developed.

This explains why sinus-lesions are so uncommon during early life. Nevertheless, they are more common than has been generally supposed.

An apt illustration is afforded by a brief reference to the following cases :

In the *first* case, a girl, aged sixteen months, had been ill for some time with a gastro-intestinal affection and also with pronounced coryza. Suddenly new symptoms developed on the part of the right eye and orbit. Great prostration and cachetic appearance of the child led the father, a physician, to infer the presence either of cellulitis or even malignant disease of the orbit. I saw the child the next day. Pronounced proptosis, asymmetry of the right side of the face with changed contour of the orbital margin, rigid infiltration and discoloration of the inner half of the upper lid, great tenderness over the region of the sinus frontalis, pointed to a sudden choking of the right frontal sinus and the adjoining cells of the ethmoid.

Preliminary to an exploratory operation, an expectant course

was decided on. The following day, in passing the finger over the swollen region, this seemed to yield to the pressure. More forcible manipulation was repeatedly practised, and this or a spontaneous rupture into the nose caused a disappearance of all the alarming symptoms without operation.

There was little room for any other conclusion than that this was a typical frontal-sinus and ethmoidal-labyrinth lesion due to pyogenic or bacterial infection from the nasal mucous membrane, or even from more remote sources—the oral and gastro-intestinal lining.

In the *second* case, an infant, several weeks after successful recovery from blennorrhœa neonatorum, developed a chronic lesion of the right frontal sinus and adjacent ethmoidal cells, followed by periostosis and a general hyperostosis of the affected region. A free incision through the soft parts and thorough curetting having failed to reduce the proptosis and lateral displacement of the globe, four weeks later, when the child was five and a half months old, a second operation was made consisting of thorough exploration of the frontal and adjacent sinuses. The sinus frontalis, considering the tender age of the patient, was found quite roomy, but empty. The anterior wall was much thickened and the posterior wall appeared pearly white. The temporal angle of the sinus was fully exposed, and here perforation had taken place, followed by the growth of an osteophyte. The adjacent ethmoidal cells were opened, found free from pus or other contents, of pearly, almost chalky, appearance. The cells were broken down and a free communication or opening was made with the nose. Recovery, with subsidence of proptosis.

In old persons the sinus frontalis may reach enormous proportions and perforate at several points.

Lesions of the air-spaces in old age may resemble malignant disease until an exploratory operation or a spontaneous disappearance discloses their real nature. Two cases to illustrate :

The *first*, a man aged sixty-four, had marked proptosis, with lateral displacement of the left eye. A distinctly circumscribed, very hard, lobulated tumor was felt occupying the inner wall, part of the roof and floor of the left orbit. An operation was proposed, but during the interval of several days only between his visit to the hospital and the day appointed for the operation, all the symptoms suddenly disappeared with prompt recession of the exophthalmus after this had been present for several years.

The *second* case, a man of seventy, by his appearance and the rapid course (six to eight months) suggested a malignant neoplasm. An unfavorable prognosis was given and, because of the extensive involvement of the tissues within and adjacent to the orbit, surgical intervention was not at once resorted to. During the following months he was kept under observation, and it was noted that suddenly a marked improvement came about, the exophthalmus receded and the extensive swelling disappeared.

In both cases, extensive osseous perforation due to erosion or pressure absorption, with extensive dissection of the periorbita, must have taken place. The ethmoidal cells were probably the principal starting-point of the lesion, and spontaneous relief was effected subsequently by a similar osseous perforation emptying the contents of the choked-up cells into the nose.

Empyema of the frontal sinuses may be eminently chronic, assume huge dimensions on the lower part of the forehead, and form multiple fistulas near and far from the original seat of the lesion.

The following brief history will illustrate the principal features of a left frontal-sinus lesion belonging to this category: H. S., Swiss, sixty-four years of age; nine years after an attack of acute coryza he began to suffer from severe headaches, with swelling of the lower part of the forehead. The paroxysms, at first interrupted and of shorter duration, became more severe and constant until a spontaneous fistulous opening a half-inch above the inner canthus came about. It discharged a thick, brownish fluid until the end of the year 1898, at which time it closed. From that time exophthalmus and diplopia became more pronounced and the asymmetry of the left side of the face more marked. The constant suffering caused by the steady increase of the lobulated tumor made surgical intervention imperative.

Inspection and exploration disclosed a frontal sinus of enormous proportions. The periorbita had been detached, and a large cavity which extended to the extreme apex of the orbit was filled with caseated pus, débris, and opalescent, ropy mucus. The orbital plate of the frontal bone was so thinned that the dura was exposed over a large area. The ostium frontale was firmly closed.

The adjacent ethmoidal cells were not implicated. The anterior cells and those near the floor of the frontal sinus were opened and a free communication established with the middle meatus of the nose. Recovery, with little deformity and the cessation of constant suffering, was brought about.

SWAN M. BURNETT (homonymous, similar, sector-like defects in the visual fields, with a probable central cause) reports the case of a woman of thirty-eight, who was suddenly attacked with a blindness on the left side, accompanied with vomiting and dizziness. The defect was found to be limited to the lower quadrant of the left fields, with a portion of the upper quadrants adjoining. The central fields were free for 10° – 15° from the point of fixation. No other central symptoms; fundus and vision normal; urine free. The size of the defects gradually decreased until, at the time of reporting, seven months after the attack, they are confined to the lower quadrant of both fields. The contraction was the same in both. The defects are of the same shape and occupy exactly the same position in the two fields. The author thinks this a clinical corroboration of Henschen's idea of the location of the centre of vision in the calcarine fissure, the cuneal or upper lip corresponding to the upper quadrant, and the lower lip corresponding to the ventral quadrants of the two retinæ. He assumes, as explanatory of the condition, that a hemorrhage or embolus occurred in the upper lip, making pressure at the same time on the lower lip of the fissure, which latter, however, was removed in time, and thus the lower quadrant, or upper field, was restored to the normal condition. The color fields were somewhat contracted, but came up to the limit in the defective fields. The patient was very conscious of the defect.

Dr. W. THOMSON, of Philadelphia, demonstrated and described a **lantern for testing color-blindness.**

By an evolution of the lantern of Donders, which has for years formed a part of the examination of the ophthalmic surgeon of the system in use on the Pennsylvania Railroad, I have produced an instrument which, like the "color stick" of wools, can be used in all testing of the road. While the wool tests have been accepted universally as requisite for the detection of color defects, the employees and their friends have always objected to their use as having no relation to their daily duties, and have demanded such colors as are employed as signals. Furthermore, two fifths of the time, during the night, of an employee's life he is expected to govern his actions by colored lights, and the lantern appears to have a practical value, imitating the night signals in form, color, intensity, and size, as they appear under all obstructions caused by rain, snow, fog, and smoke. Its power over the wools to

detect the central amblyopias of tobacco, alcohol, drugs, disease, and scotoma, that would not be revealed by the skeins, makes it a necessity.

I propose this lamp, or lantern, then, as an adjunct to the "color wool stick," to be used, if desired, under the supervision of the Division Superintendent, by intelligent laymen. With this addition to the Pennsylvania Railroad system it seems to me more complete, and sufficient to eliminate from any road all color-blind employees and to furnish an insuperable barrier to their admission to service.

The lantern consists of an asbestos chimney, which can be placed on the kerosene lamp in universal use on the railroads, or over an Argand or other gas light, electric lamp, or spring candle-stick. Two disks, four inches in diameter, are so placed upon the chimney as to permit their being partly superimposed. The lower disk contains ten glasses in apertures 10 *mm* in diameter, having the white, red, green, and blue colors in general use. This may be considered the examination in chief, whilst the upper disk, when combined by turning one or both, furnishes the "cross examination." The upper disk has four apertures, ranging from 1 to 10 *mm*. The other six have one white ground glass, one deep London smoke, one pink, one green, and one cobalt glass.

The combination of white ground and the smoke glasses, with the reds and greens of the lower disk, enable all atmospheric conditions to be imitated, and the lights to be diminished in brightness and tint. The placing of the small openings enables size and distance to be imitated.

The standard of normal color sense is taken as one *mm* opening at five metres. A man failing to see the light at this distance may have it increased ten times. Again failing, he may approach to half a metre and reveal a color sense equal to $\frac{1}{100}$ only. Since the color-blind depend alone on intensity or brightness to distinguish the white, red, and green colors, the diminishing effect of the ground glass and of the London smoke often reveals the defect. The cobalt, transmitting blue and red both, is usually described by the color-blind as blue, which color they always see well. The cobalt combined with the lower reds gives a very deep-red color which, when compared with the usual red, may induce the color-blind to name one red, the other green. Combined with lower blue it gives a deep pink, called blue by the color-blind.

In the pink, medium-smoke and light-green glasses in the upper disk, I have imitated the "confusion colors." The pink looks cherry-red to the normal eye, but it transmits both red and blue by the spectroscope, hence the color-blind pronounce it blue, or, when backed by the yellow kerosene flame, white. The light green is always called white, as is also the light gray of the medium London smoke. Hence we have in these three glasses tints which the color-blind name white.

The upper disk has its ten openings marked by the letters of the alphabet, and the lower by the numerals from one to ten. The examination should be made in a darkened room, and the results reported on the blank now in use, the details being used when requisite.

An interesting experiment can be made by the ophthalmic expert in his demonstrations to the Division Superintendent and his examiners, by placing the chimney over an alcohol lamp containing some sodium chloride. The mono-chromatic light thus formed destroys all the colors in the glasses and renders the observers totally color-blind. The stick of colored wools should also be illuminated by this means, and its power to destroy the ability of the normal-sighted to select the colors will enable them partly to comprehend the defect of the congenitally color-blind for red and green.

The system of the Pennsylvania Railroad has been in use since 1881, and has been adopted by other corporations controlling 150,000 miles of track. It may now be considered complete.

Dr. CHARLES A. OLIVER presented a **clinical study of the ocular symptoms in so-called posterior spinal sclerosis** based upon a series of more than one hundred cases that he had personally examined during the past five years; reserving the result of histologic study of the ocular tissues for a number of future papers.

Recognizing the newest teachings in regard to the disease and separating for convenience sake the ophthalmic symptoms into those that are expressive of the ordinary subdivisions of the optic and the spinal types of the disorder, he drew two symptomatologic pictures.

In the former, he found a number of evidences of early inflammation in and around the eyes: a type of disorder which seemed to exert the brunt of its force upon the ocular structures, and even in many cases thus seeming to act beneficially upon the general system.

In the latter, the signs of previous inflammation of the ocular nerve elements, though not so gross, and in fact, even of no apparent moment to the careless or ignorant observer in the earlier stages of the disease, were just as certain—this type of the disease exhibiting the grossest alterations in the general condition of the subject.

The paper was accompanied with an exhibition of water-color sketches of the ophthalmoscopic conditions.

Dr. CHARLES A. OLIVER gave a carefully detailed history of a **case of removal of an orbital lympho-sarcoma with preservation of normal vision.**

Occurring in a goitrous subject, free from any other sign of Hodgkin's Disease, and with the history of acquired syphilis, the tumor furnished the ordinary symptoms of exophthalmos with bulbar displacement; mechanical and functional limitation of mobility of the eyeball; diplopia; contraction of the retinal arteries; and engorgement of the retinal and conjunctival veins: in fact, most, if not all, of the pressure-symptoms of a retrobulbar growth.

The tumor successfully extirpated without any injury to the eyeball or its functioning power, merely giving rise to a temporary disturbance of the contiguous muscular structures, serves to illustrate the average results of ophthalmic surgery of to-day.

The findings of the microscope, which necessarily are indeterminate as to such growths being truly sarcomatous or lymphomatous in character, taken into consideration with the multilobular nature of the mass, distinctly point to its being a lympho-sarcoma.

The lapse of time since the removal of the growth without the least signs of any local or metastatic expression of the former disease, although of course of too brief a period for any certainty of conclusion, is of much importance in showing that the growth was not malignant in character; while the return of the organ to its original healthy condition is a result which must be considered as most fortuitous.

JOHN E. WEEKS, M.D.: **On operative treatment of entropion by the transplantation of a flap of mucous membrane.**

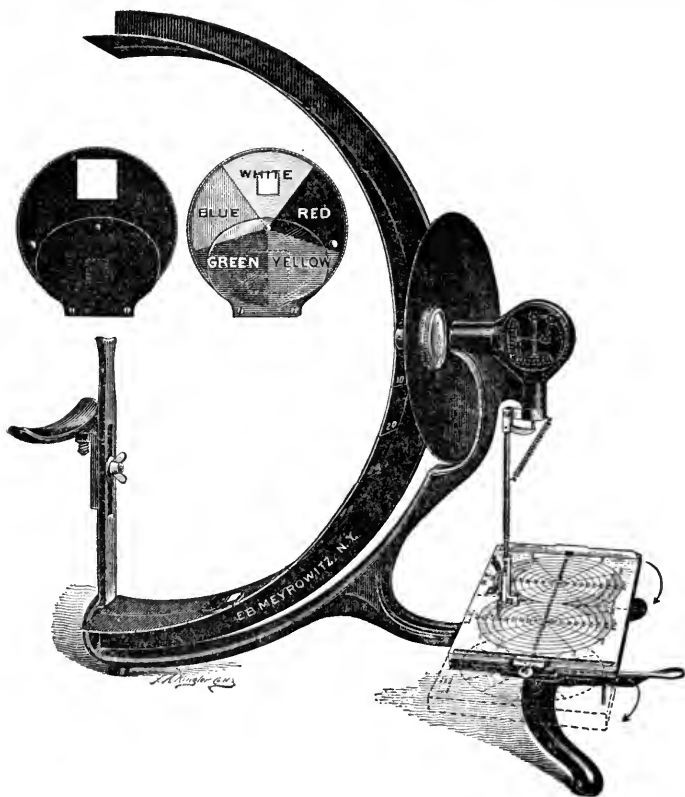
After recounting the conditions ordinarily present in cases of entropion, the writer mentioned his objections to the methods of operating generally in vogue and, as a result of his experience, recommended a modification of the Streatfeild-Snellen operation

combined with the Van Millingen method of transplanting a strip of mucous membrane from the lip to the margin of the lid.

Canthoplasty is performed in all cases where the palpebral fissure is much shortened by the pathological process that has produced the entropion. The writer is of the opinion that reconstruction of the lid margin is necessary in many cases and states that in entropion of the lower lid reconstruction of the lid margin combined with canthoplasty is often all that is necessary to correct the condition.

After having employed flaps from many sources the writer finds that the mucous membrane from the lip is best adapted for the purpose and is most conveniently obtained.

Dr. F. D. SKEEL read a paper on **a new self-recording perimeter**. This perimeter is self-recording. The indices are



translucent and are illuminated by small electric lamps placed behind them, a small battery furnishing the current necessary.

Thus the illumination is rendered constant at all times. The indices are five in number and are arranged on a revolving disc, one only being visible at a time. They are square in shape and measure 10 *mm* in diameter. This diameter may be reduced to 5 *mm* by a small shutter attached to the disk. In color the indices are blue, green, orange, red, and white. The stationary index or fixation point is of course white. The perimeter may be used by reflected light in the ordinary manner, colors appearing the same as by the transmitted light. The disk described is carried upon a sliding arc of metal enclosed within the main arm common to all instruments of this class. This sliding arc is actuated by a milled head and rack and pinion which is placed at the back of the instrument near its axis so that the hand of the examiner is not seen by the patient when moving the index along its arc. In order to make the instrument self-recording the movement of this sliding arc is transmitted backward through the axis of the instrument to a finger bearing pencils which in color correspond to the colors of the indices borne by the revolving disk. This finger automatically takes a position above the chart corresponding to the position of the index in the field of vision and the record is made by depressing a lever at the back of the instrument. There are no graduations to read and no mental calculations to make. The examiner's attention is free to fix itself upon the patient.

Dr. Skeel wishes to acknowledge the courtesy and intelligent skill of Mr. E. B. Meyrowitz in the completion of this instrument.

Dr. J. A. SPALDING, Portland, Me.: **Optic atrophy from blows on temple or forehead.** There were four cases of loss of sight in one eye from optic atrophy, the probable result of blows on forehead or temple. The *first* case was that of a railroad employee, hit with a small stone attached to a cord, the man being carried by train-impetus violently against it. In a few days the sight of the eye, beneath the small injury on the temple from the stone, began to lose vision and the case ended in optic atrophy. The *second* case was of a woman who ran against the sharp edge of a door in the dusk, the *third* that of a lady thrown from a cycle in a collision with another rider, and the *fourth* was of doubtful origin, although the patient was picked up unconscious after a fall from his cycle. The last case may have been due to insolation or acute meningitis. All terminated in optic atrophy.

In two there was retinal hemorrhage arising apparently from

the optic-nerve sheath. The interesting points about all, were rapidity of loss of sight, and the behavior of the pupil, contracting and dilating consensually to light or shade, so that such movements could be utilized for cases of simulated unilateral blindness.

Dr. C. A. VEASEY, of Philadelphia, related a case of **excision of the lachrymal sac and gland followed by an unusual variety of neuro-paralytic keratitis markedly resembling clinically the so-called lattice-like keratitis.**

The patient, a married woman, fifty-eight years of age, had suffered for a long time from recurring attacks of acute dacryocystitis. The usual treatment was instituted without much success, so the lachrymal sac and gland were extirpated. Healing was prompt, the sutures being removed on the fourth and fifth days. On the eighth day after the operation, when the lips of the wounds were firmly united and the sites of the incisions were indicated only by two narrow lines, the patient complained of intense pain accompanied by some conjunctival secretion. On the following day, the ninth since the operation, there was present a severe membranous conjunctivitis, with roughness and some peeling of the corneal epithelium on the side of the operation. The conjunctival secretion showed small quantities of the diplococcus of Fraenkel but no other micro-organisms. The peeling of the cornea continued, the epithelium became more roughened and looked as if sprinkled with some coarse substance, and there were numerous small spots of opacity apparently just beneath the epithelium. With the loupe, Decemet's membrane was seen thrown into folds, forming the panel figure described by Schirmer by the crossing of the lines of the folds. Later there appeared numerous fine lines in the anterior portion of the cornea, probably in Bowman's membrane, more marked near the centre of the lower inner quadrant, and crossing each other in an irregular manner so as to form a sort of lattice-work, with the spaces resembling various geometrical figures, as parallelograms, triangles, rhomboids, etc. On the thirteenth day after the operation the membrane had mostly disappeared and the cornea was found for the first time to be partially anæsthetic. The anæsthesia continued to increase and in a few days involved both the cornea and conjunctiva, but at no time was any other portion of the face affected. The pupil dilated only moderately under atropin and the tension continued normal throughout the course of the disease. Treat-

ment was of little avail until the administration of thyroid extract was begun, when there was prompt amelioration of the symptoms, the cornea clearing, and the sensation returning. An examination at a much later period showed slight haziness of the central portion of the lower inner quadrant, about $3\frac{1}{2}$ mm in diameter, with persisting anæsthesia over the same area.

I. A papilloma of the plica semilunaris.

Dr. G. E. DE SCHWEINITZ described a growth arising from the plica semilunaris of a colored man aged fifty years. Histologically the structure of the growth repeated that of the papillæ and was typically branched or cauliflower in appearance. In connection with the presentation of the case the differential diagnosis, both clinical and microscopical, of polypi, angiosarcoma, granulation tumors, and papilloma of the conjunctiva was discussed.

II. The histology of the lachrymal gland in chronic dacryocystitis.

After reviewing the observations of Bock, Stanguléanu, and Théohari, Dr. DE SCHWEINITZ described the microscopical findings in a lachrymal gland which he had removed to relieve the epiphora produced by chronic dacryocystitis, the gland itself not having shown any signs of disease before operation and not having been in the least enlarged. There were extensive lesions, confined, however, entirely to the interacinous connective tissue, which was everywhere invaded by quantities of small round cells, which were irregularly scattered or specially gathered in rows or "streets" and in some places in roundish masses. They were particularly conspicuous around the ducts. The cells were of the lymphoid type, being exclusively mononuclear. The epithelium of the acini was in fairly good condition and showed none of the changes which had been described by French observers in connection with epiphora. The process was a chronic interstitial inflammation, and in many particulars resembled the changes which Bock had found in symptomatic dacryoadenitis. The compensatory atrophy of the corresponding lachrymal gland which Tscherno-Schwartz has described after extirpation of the lachrymal sac could not be noticed in Dr. de Schweinitz's case, although a year had elapsed between the extirpation of the sac and the removal of the gland.

HOWARD F. HANSELL, M.D., Philadelphia: A case of **acute double retrobulbar optic neuritis, probably hereditary in origin.** A man of fifty-six discovered on awaking one morning

that his vision was greatly reduced in both eyes. Examination on the following day showed a moderate degree of optic neuritis without blotches of exudation or hemorrhage in either fundus; absolute central scotoma for white and all colors; no limitation of the periphery of either field; pupils dilated, responsive, and equal; $V_{\frac{2}{0}0}$, excentrically. Several aunts and uncles on his mother's side had become nearly blind in adult life, a brother lost the greater part of his vision at thirty-seven, gradually, and another brother, suddenly, at fifty years of age. In none was vision restored by treatment or time, but, after progressing for some months, it became stationary. There was no history of syphilis, hereditary or acquired, or of tobacco or alcohol amblyopia, or of hereditary affections of the central nervous system, and no disease of the heart or abdominal organs.

In the course of three months the inflammation of the papillæ had subsided and was succeeded by signs of atrophy, marked on the temporal sides of the disks.

Reference is made to the literature of the subject.

Dr. C. M. CULVER, Albany, N. Y.: **On the material composition of printed matter.** Reading is one of the most important functions of the human eye and the most frequent means of eye-strain. Much of the strain thus produced might be prevented by making printed matter more legible. Javal, Cohn, Jeffries, and Holden have investigated and written instructively in this connection. The legibility of printed matter is, as Dr. Holden writes, "not a matter for cut and dried rules, but of experimentation—type, spacing, leading, color, surface and quality of paper, all must be taken into account." The writer has n't reached final conclusions, but is in collaboration with Mr. Dewey, librarian of the State, his staff, and members of the State Library School, hoping to decide. A page of the *Archives of Neurology and Psychopathology*, the result of much work by Dr. Holden, seems freest from fluttering of colors. Long primer type, in columns of nine to ten centimetres in width, two millimetres between lines, black ink on white, non-calendared paper, seems very legible. The horizontal spacing between the vertical, main strokes of letters is difficult to determine. It now seems best to decide *by trial* as to which kind of print is least causative of eye-fatigue. Then it may be best to find, otherwise, the reasons for this result.

CHARLES W. KOLLOCK, M.D., Charleston, S. C., read **notes upon the surgical treatment of a case of myopia.** A

young man nineteen years of age had rapidly progressing myopia. In 1895 with each eye he could see 3/CC and with -13 D 15/L. -10 D was given for constant use. In 1899 the myopia had increased 3 D and it required -16 D to give the former vision of 15/L. The surgical treatment was advised and agreed to. After several discussions the lens was removed without iridectomy through an upward corneal section. After recovery, which was prompt, his vision had increased from 3/CC to 15/LXX, and with +1.50 +2.50 cyl. ax. 90° he now sees 15/XL, and reads with +5 +2.50 cyl. ax. 90° Jaeger No. 1 easily. The fellow eye has been operated upon and the lens is rapidly breaking up and absorption will soon be complete.

For children and young adults he thinks no operation but discussion should be done, as the lens is softer and the danger of retinal detachment is less than when the method by extraction is practised. In cases of congenital or rapidly progressive myopia, especially when heredity plays a part, as it occasionally does, he advocates the removal of the lens before the 12 D point has been reached, hoping thereby to retard or stop the progressive structural changes.

DR. DUNBAR ROY, of Atlanta, Ga., read a paper on the **effect of flashes of electric light upon the eye.** More cases have been observed probably than are reported of injury to the eyes from flashes of electric light. Three cases were reported where the patients were temporarily blinded from a flash of light due to the accidental crossing of two electric wires carrying a voltage of 500.

The symptoms in all three cases were the same — severe pain and photophobia coming on a few hours after the injury, slight circumcorneal injection, haziness of the cornea, intense contraction of the pupil. The patients all recovered perfectly with normal vision. The treatment consisted in the wearing of smoked glasses and the dropping into the eye of a mild solution of atropine.

The author believes that the use of the incandescent electric lights is injurious to the eyes and reports a case of severe iritis in which the cause was attributed to the incandescent light. In a girls' boarding-school, a great number of the students suffered with their eyes until the gasoline student's lamp was substituted. The Welsbach gas light, with a shade beneath, the author holds is the best light for reading purposes. The subject of traumatic

changes in the macula lutea was also discussed, quoting from Haab, who has made extended researches on this subject. It is still a mooted question whether the changes in the region of the macula lutea from electric flashes are of a chemical or mechanical nature. Further investigation will have to be made.

J. A. LIPPINCOTT, of Pittsburg, Pa., read two papers :

I. On **spasm of accommodation in glaucoma relieved by eserine**. A woman of thirty with chronic simple glaucoma almost absolute in the left eye and progressing in the right, of which the visual field was limited to a small quadrant (lower, outer) ; V in this eye = 20/C, but with $-4.5 \text{ D} = 1 \text{ cy. } 145^\circ = 20/\text{xxx} -$. Under the use of a mild solution of eserine the myopia disappeared so that with a $+1 \text{ cy. } 58^\circ \text{ V} = 20/\text{xx} -$. It was observed that if a moderately strong solution of the myotic was employed, myopia was again manifested.

The case is similar to that reported by Dobrowolski in the *Klin. Monatsbl. f. Augenheilk.* for June, 1899.

II. On **the advantages of strong portable or easily movable magnets in eye surgery**. The author during the last four years has been using a magnet weighing nine pounds and capable of lifting a mass of iron weighing about fifty pounds. The instrument is suspended by means of a wire cord which runs through two pulleys in the ceiling of the operating-room. A counter-weight at the other end of the cord holds the magnet at any desired height. The instrument can thus be handled with little effort and with great delicacy. With such a magnet it is possible in the great majority of cases to diagnosticate the presence, and quite frequently to ascertain the location, of the foreign body without the loss of time involved in an X-ray or sideroscopic examination. In the rare cases in which positive evidence (in the shape of pain and movement in the ocular tissues on the approach of the magnet) is not afforded, the test should not be considered final but recourse should be had to the above means.

The ease with which the suspended magnet can be manipulated is of great advantage when the recumbent position is advisable, *e. g.*, where general anæsthesia is necessary and when removal of the crystalline lens, iridectomy, etc., are called for.

The author reports fourteen cases of iron or steel fragments in the interior of the globe which he has seen during the past twelve months. Of these, ten were in the anterior part of the eye. Nine of them were operated on with good results. One refused oper-

ation. Of the four cases in which the steel was in the vitreous chamber, one demanded enucleation on account of marked sympathetic neuro-retinitis. In the three other cases the metal was removed by the magnet with the preservation of the globe. In two the vision attained was quantitative, in the other, which is recent, a good visual result is expected.

Dr. S. C. AYRES (Cincinnati, O.) read a paper entitled **Observations on some blind but quiet and apparently inoffensive eyes. Do they produce a pseudo-sympathetic inflammation?**

The writer refers to the fact that blind eyes are often retained in the orbit for many years without exciting any trouble in the good eye. He relates five cases where the patients had a blind eye which was perfectly quiet and free from all evidence of inflammation. The fellow eye was affected by exudations into the vitreous in all cases, and in one by hemorrhages also. These exudations were principally in the posterior portion of the globe. The symptoms were not like sympathetic iridocyclitis, as the ciliary zone was not sensitive or inflamed. Of the six cases three were blind from trauma, one from corneal disease, one from ophthalmia neonatorum, and one from detachment of the retina. Enucleation in the five cases without any other treatment resulted in prompt and so far permanent improvement to vision.¹

ARTHUR E. EWING, M.D. (St. Louis, Mo.), described **an operation for atrophic entropion, especially of the lower lid.** In this operation the conjunctiva is dissected back three to four millimetres from the margin of the lid, beginning near the openings of the Meibomian glands. This dissection is made the full length of the lid, from the outer canthus to the punctum. An incision is then made through the tarsus, also the full length of the lid, as in Dr. Green's operation. At the bottom of this incision, at the junction of the tarsus with the orbicularis muscle, three sutures are entered, one at the centre, and one near either end of

¹ When Dr. Ayres sent the abstract of his paper, he added the following case: "Since writing the paper I read in Washington, I have had another case of the same kind—briefly: The young man had choroiditis in both eyes in 1893, but vision (0.5) in each eye. In 1896, r. e., V = 0.5; l. e., V = shadows, pupil closed.

"About five weeks ago I examined him and found exudations in fundus near m. l. and V reduced to 0.2. I enucleated the blind eye and to-day he called on me and I found V = 0.5, as good as it has been since 1893, and he reads Gn. No. 2. Was this improvement brought about by the enucleation? It is a post hoc ergo propter hoc argument, but the results are very satisfactory. Have you had any similar observations? I have looked over the literature in vain for some light on this subject."

the incision. These sutures are brought out near the centre of the raw surface of the divided tarsus, carried over a roll of gauze or absorbent cotton (three millimetres in diameter), placed on the skin surface just below the cilia, parallel to the tarsal margin, and tacked into the skin below the roll. When these sutures are tied the margin of the lid containing the cilia becomes strongly everted. With half a dozen or more fine stitches the conjunctival flap is brought forward also into the depth of the tarsal incision, the purpose being to cover with mucous membrane the raw surface of the posterior portion of the divided cartilage and the exposed orbicularis muscle. After two or three days the cotton or gauze roll is removed, but the stitches in the cartilage are retained, and with them and the aid of such cilia as are available the eversion is maintained a week or ten days longer by means of contractile collodion.

A paper by ARTHUR E. EWING, M.D., and GREENFIELD SLUDER, M.D. (St. Louis, Mo.), was read, entitled, **frontal headaches, apparently ocular, but really of nasal origin, their recognition and treatment; particularly those depending upon an abnormal relation of the uncinate process of the ethmoid to the bulla of the ethmoid.**

Many obscure headaches that seem to be ocular are really nasal. In these cases pressure upon the inner and upper-inner wall of the orbit, particularly over the region of the pulley of the superior oblique muscle, the orbital plate of the frontal bone, and the os planum of the ethmoid, reveals abnormal tenderness. The trouble may be a neuralgia; or an empyema or mucocele of the accessory nasal cells, ethmoidal or frontal; or a closure of these cells: in the frontal, from a slight swelling of the membrane in a narrow infundibulum; in the ethmoidal, by the bulla jutting upward and backward tight under the ethmoid. In the last instances the accompanying dull headache, for which the oculist is mostly consulted, is due to alteration in the air pressure. By ordinary inspection such cases may show no pathological changes in the nasal passages. Treatment consists in opening the air passages by shrinking the membrane through medication, or, when this cannot be accomplished, by removal of the anterior portion of the middle turbinate, and if necessary the uncinate process of the ethmoid.

Dr. H. KNAPP (of New York) described **a case of traumatic non-infective thrombosis of the cavernous sinus.** Operation by Dr. Frank Hartley, of New York. Mr. Cuffe, æt. about twenty-six. To be published in full in our next issue.

BOOK NOTICES.

IX.—**Atlas und Grundriss der Ophthalmoscopie und Ophthalmoscopischen Diagnostik.** Von Prof. O. HAAB, M.D., Zurich. Third, greatly enlarged, edition. J. F. Lehmann, Munich. Bound, m. 10.

This deservedly very popular atlas of 149 colored and 7 black illustrations appears in its third German edition three years after the second, and no doubt the English translation will follow in a short time.

The book—small octavo—begins with an introductory text of 82 pages on the description, choice, and use of the ophthalmoscope, the different methods of examination, skiascopy, and the description of the normal fundus oculi, with an—unnecessarily lengthy—explanation of the pulse phenomena of the eye. Haab recommends a simple ophthalmoscope, and first to learn the examination in the inverted image, as by far the most useful (the drawings in his atlas are all made in the inverted image). He says it is advisable to increase the inverted image by looking through an eyepiece of $+2$ to $+4$ D to be placed behind the sight-hole. The reviewer knows from a lifelong experience that an eyepiece is useful not only as a magnifier, but it will force the physician to accustom himself to look through the ophthalmoscope, as one ought to do through all optical instruments, with relaxed accommodation. Any one who has learned to look through an eyepiece of, say, $+10$ D, in the inverted image, will learn easily how to examine eyes in the erect image without accommodating. The author dwells on the advantages for beginners of making sketches of the background of the eye, because this is the best way not only to fix in their memory what they have seen, but to learn to see accurately. The direct method is invaluable for recognizing minute details and estimating the refractive condition of the eye, not only in the axial part, but all around so as to map out

the topography of the fundus. All this the reviewer heartily indorses, and he would advise his young colleagues in the art of ophthalmoscopy, as in every art, to begin right so as not to fall into bad habits.

The ophthalmoscopic drawings of the atlas are all executed in colors by the author himself, and well reproduced, which, considering the low price of the book,—only \$2.50,—is highly to be commended. The collection is numerous enough to represent all the important conditions of the background of the eye.

To assist the student in correctly interpreting the many pictures the ophthalmoscope discovers, a considerable number of microscopic drawings of corresponding eyes accompany the ophthalmoscopic pictures; for instance, sections of the optic nerves in partial and total atrophy in locomotor ataxia, the anatomical changes in glaucoma, in retinitis albuminurica and diabetes, in pigmented retinal degeneration, in orbital tumors interfering with the circulation of the eye, in pernicious anæmia, in disseminate choroiditis, in tuberculosis, etc. The ophthalmoscopic pictures, as well as the anatomic, are accompanied by short but sufficiently explicit explanations with full practical notes, not only on the diagnosis, but also on the significance (prognosis) of the conditions illustrated.

Haab's atlas should (and can) be in the hands of every student before he takes his degree, for no one should be allowed to pass unless he shows a practical proficiency in ophthalmoscopy. The atlas under consideration will not only help the student readily to acquire the prescribed knowledge for his examination, but it will also remain a companion for reference in his practice. For the ophthalmic practitioner, this newest edition of Haab's atlas will be pleasant and profitable reading, for nothing is so instructive and enjoyable as to go over a well-prepared, up-to-date text-book, especially an atlas, to refresh one's memory and learn in a systematic way what advances have been made in our field of labor.

H. K.

X.—Diseases of the Eye. By EDWARD NETTLESHIP, F. R. C. S., London; revised and edited by WM. C. POSEY, M.D., Philadelphia; with a supplement on Examinations for Color-blindness and Acuity of Vision and Hearing, by WILLIAM THOMSON, M.D. Sixth American from the sixth English edition, with 5 colored plates and 192 engravings. Lea Bros. & Co., Philadelphia, 1900. \$2.25.

This 12mo volume of now 562 pages is very well gotten up by the publishers and carefully prepared by the new editor, who is a representative of a bright set of young Philadelphia oculists and favorably known by several valuable papers. The book begins, Part I., with a presentation of optical outlines for oculists, and the methods of examining the different parts of the eye by inspection, palpation, the ophthalmoscope, test-types, spectacles, ophthalmometer, perimeter, etc. Part II., clinical division, describes the various affections of the eye materially as in the previous editions; the operations occupying a chapter by themselves. Part III. treats of the affections of the eye in relation to general diseases, rather more extensively than in most other text-books, and with an arrangement putting the general disease forward and informing the reader in what way the visual organ may be affected by it, viz.: Eye diseases caused by: syphilis, acquired and inherited, smallpox, malarial fevers, cerebro-spinal meningitis, diabetes, tuberculosis; diseases of the brain: tumor, hydrocephalus; diseases of the spinal cord: locomotor ataxia, myelitis, etc.; nerve diseases: herpes zoster of the fifth pair, sympathetic nerve, etc. This part is particularly valuable to the general practitioner. If he knows the general disease and his patient complains of his eyes he will find information by looking up the general disease in the very detailed index, for instance meningitis, and he will be referred to the proper place or places.

This new edition of Nettleship, though not altogether up-to-date in its nosological part, may well be recommended to the student who wants a book to make himself practically acquainted with the whole contents of ophthalmology, and later to refer to when he meets eye diseases or ocular complications in his general practice.

H. K.

XI.—A Dictionary of Medicine and the Allied Sciences. By ALEX. DUANE, M.D. Third edition, enlarged and thoroughly revised, with 8 full-page colored plates. Lea Bros. & Co., Phila. and New York, 1900.

"The present edition contains a vast amount of new material, representing the great advances made in all branches of medicine since the previous edition was issued, 1893." Its bulk has been kept at the former limit. This has been achieved by letting "practical utility rather than historical tradition control the selection of matter, hence the work differs from most of its contemporaries in omitting words which are nowadays found only in

dictionaries." The type of the new edition is sharp, but a trifle smaller, and the paper somewhat whiter than in the previous edition ; the paper of the latter was cream-colored and without any gloss. The text-plates are a valuable addition. The book is, probably, the most reliable and instructive and the most convenient linguistic companion at our command H. K.

XII.—Manual of the Diseases of the Eye, for Students and General Practitioners.—By CHARLES H. MAY, M.D., Chief of Clinic and Instructor in Ophthalmology, College of Physicians and Surgeons, Columbia University, New York. 12mo, 406 pages, with 243 illustrations. W. Wood & Co., 1900.

This handy text-book is well designed and well executed. It presupposes the general medical knowledge of an average third or fourth year medical student and gives in a simple, concise style all the student and practitioner should know to recognize and understandingly treat all the diseases of the eye, as they occur in a general practice. The connection between eye and general diseases is never neglected. The many illustrations are a great help. The book can be highly recommended.

H. K.

MISCELLANEOUS NOTES.

COUNT MAGAROLY, M.D., Privy-Councillor, has resigned his position as Director of the University Eye Clinic in St. Petersburg, which by his talent, industry, and devotion he has made one of the greatest institutions of its kind in the world.

Prof. VON ROTHMUND, M.D., has resigned his professorship at the University and his position as Director of the Eye Clinic of Munich. Geheimrath Dr. JUL. HIRSCHBERG has been appointed professor ordinarius honorarius.

Dr. ST. BERNHEIMER, of Vienna, has been appointed Professor in Ordinary of Ophthalmology at the University of Innsbruck, succeeding Prof. DIMMER, who follows a call as Professor of Ophthalmology at Gratz in Styria.

Dr. R. O. BORN, of New York, has been appointed Professor of Ophthalmology at the New York Polyclinic and Hospital.

Prof. CARL HESS, of Marburg, succeeds Prof. J. v. MICHEL, of Würzburg, resigned.

Prof. E. VON MILLINGEN, in Constantinople, and Dr. LEOP. GROSSMANN, in Budapest, are dead.

Dr. F. VAN FLEET and Dr. EDW. GILES have been appointed surgeons to the Manhattan Eye and Ear Hospital, New York.

Dr. E. S. PECK has been appointed Professor of Ophthalmology, N. Y. Post-Graduate School and Hospital.

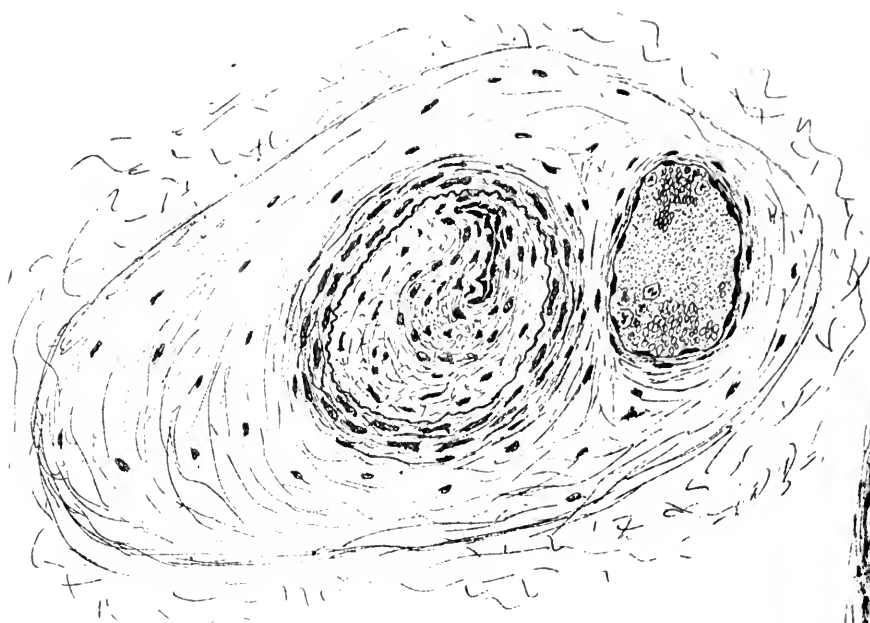
Dr. GEORGE EDWARD FROTHINGHAM, of Detroit, Mich., died at his home on April 24, 1900, after several months' illness, at the age of sixty-four.

Born in Boston, Mass., in 1836, he was educated at Phillips Academy, Andover, and other New England schools, in all of which he took a prominent position as a scholar. After teaching a few years he took a course in medicine at the University of Michigan, from which he was graduated in 1864. He then engaged in general practice in Massachusetts, where his work attracted immediate attention, and three years later he was called to a position at the University of Michigan, where at that time ophthalmology was included under general surgery. In 1870, the chair of ophthalmology was created, Dr. Frothingham being appointed by the regents to fill it. The wisdom of the regents in appointing him was proven by the popularity of this department, which Dr. Frothingham raised from a small beginning to one of the most important in the country. Keeping himself thoroughly abreast of his confrères, his reputation spread over the country, and, being possessed of a logical mind and an eloquent tongue, his personal influence had much to do with the progress of the medical department. His literary tastes led him to write pamphlets on various topics relating to his profession, and he was a member of various medical and scientific organizations. His success as an eye surgeon had been great.

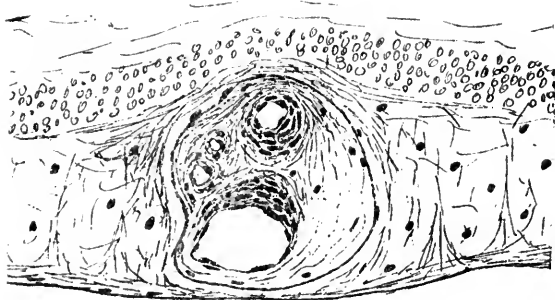
In 1889, after a service of twenty-two years, he resigned from the faculty and moved to Detroit, Mich., where he engaged in private practice and was consulting ophthalmologist to Harper Hospital and the Children's Free Hospital.



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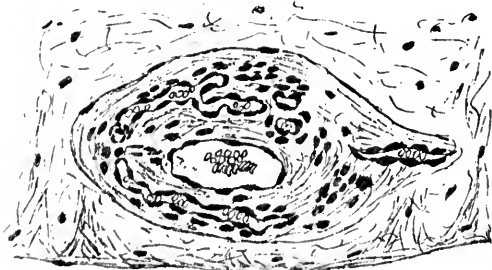
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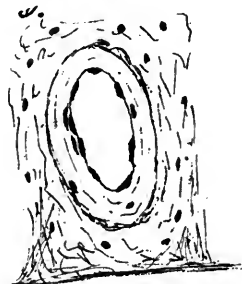
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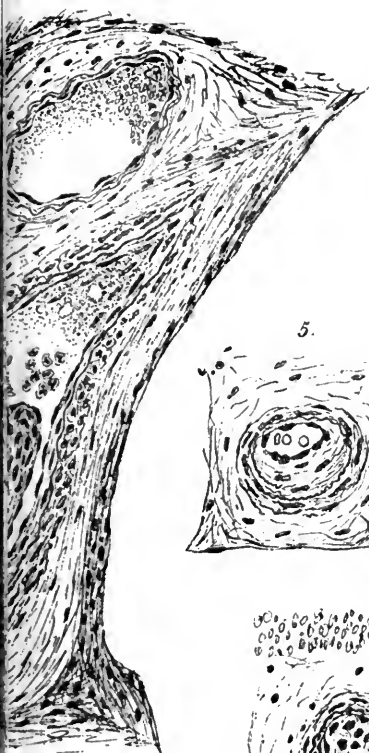
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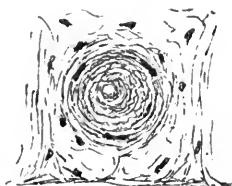
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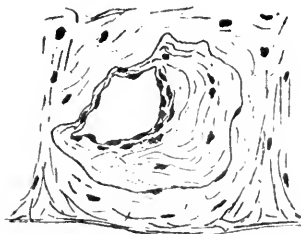
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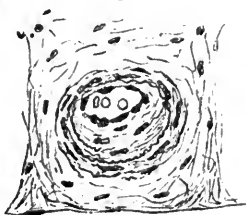
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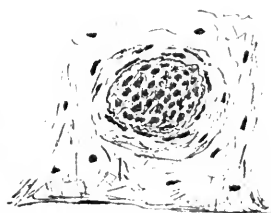
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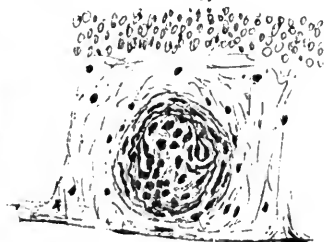
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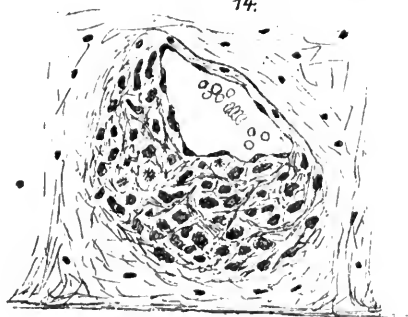
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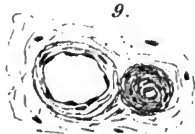
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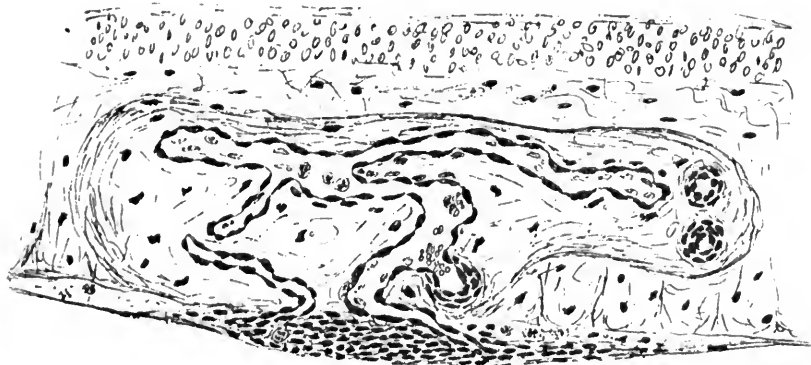
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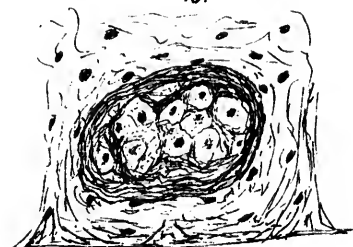
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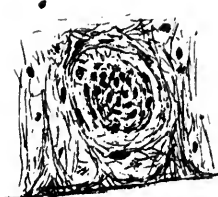
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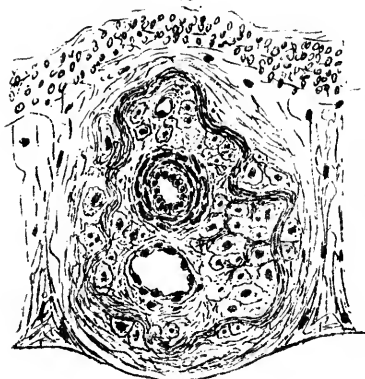
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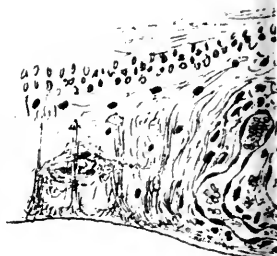
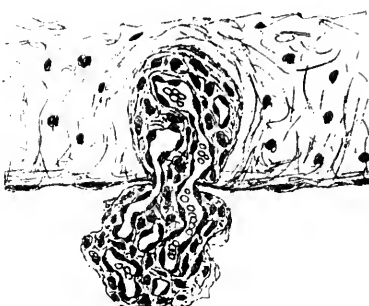
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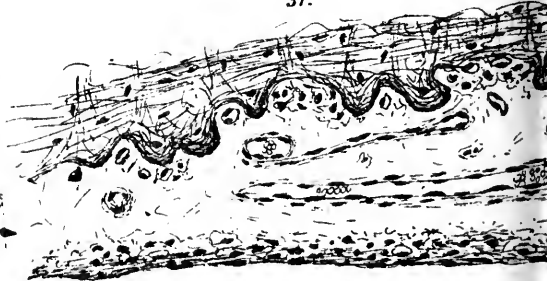
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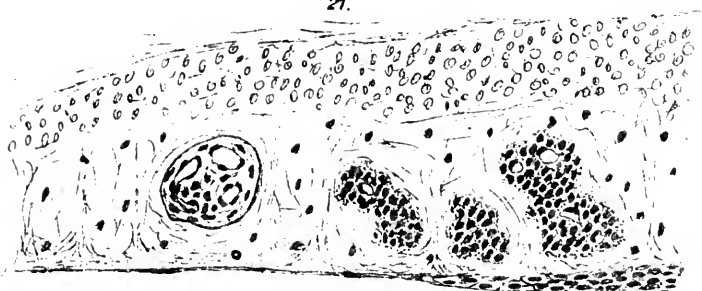
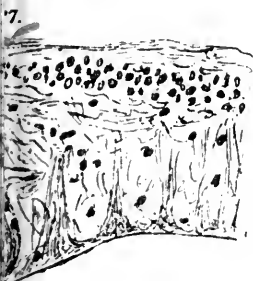


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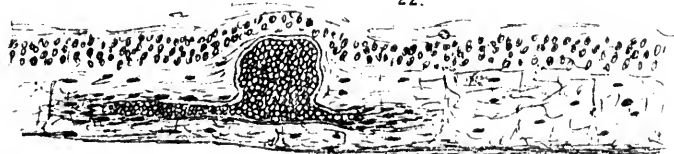




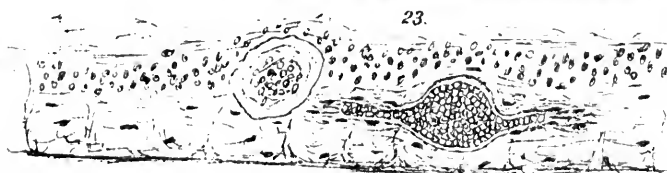
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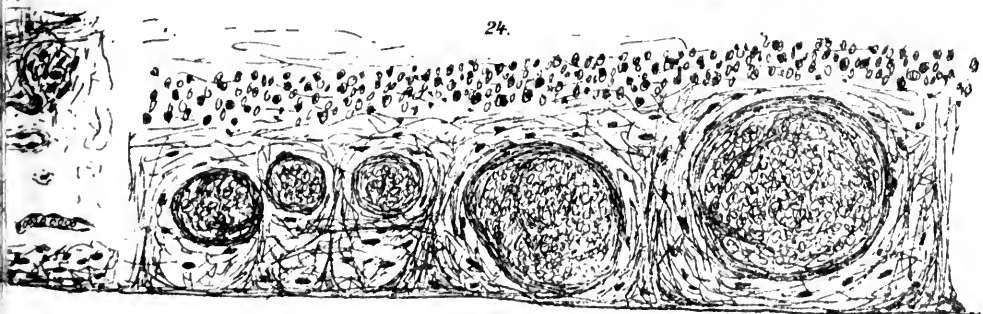
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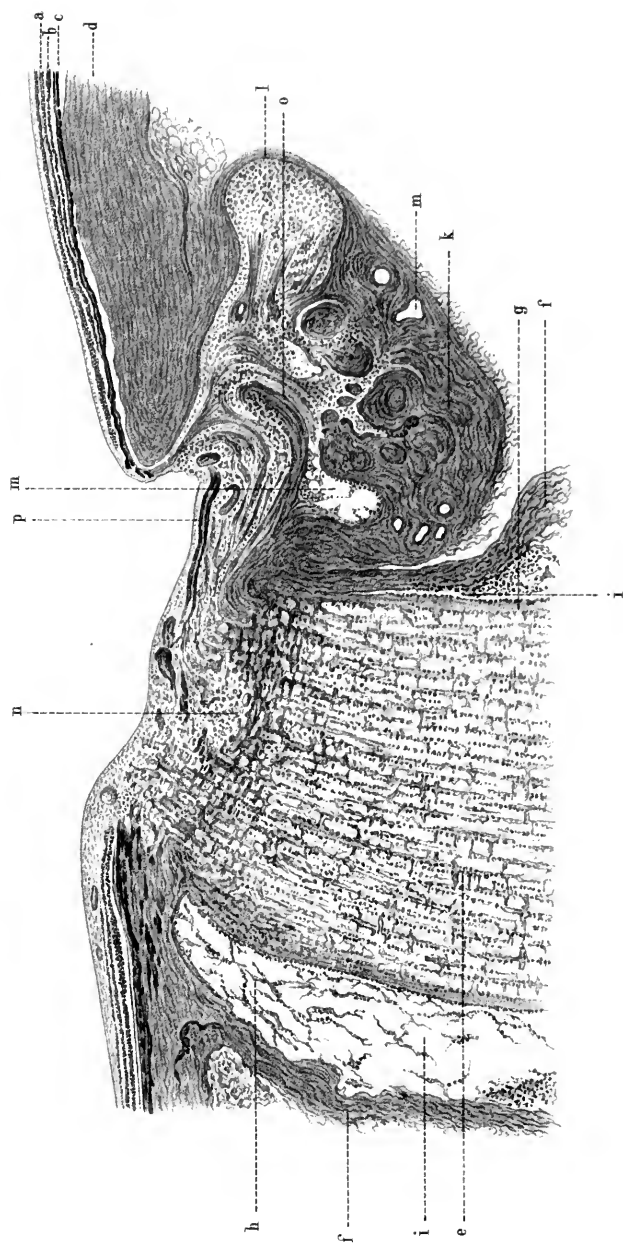


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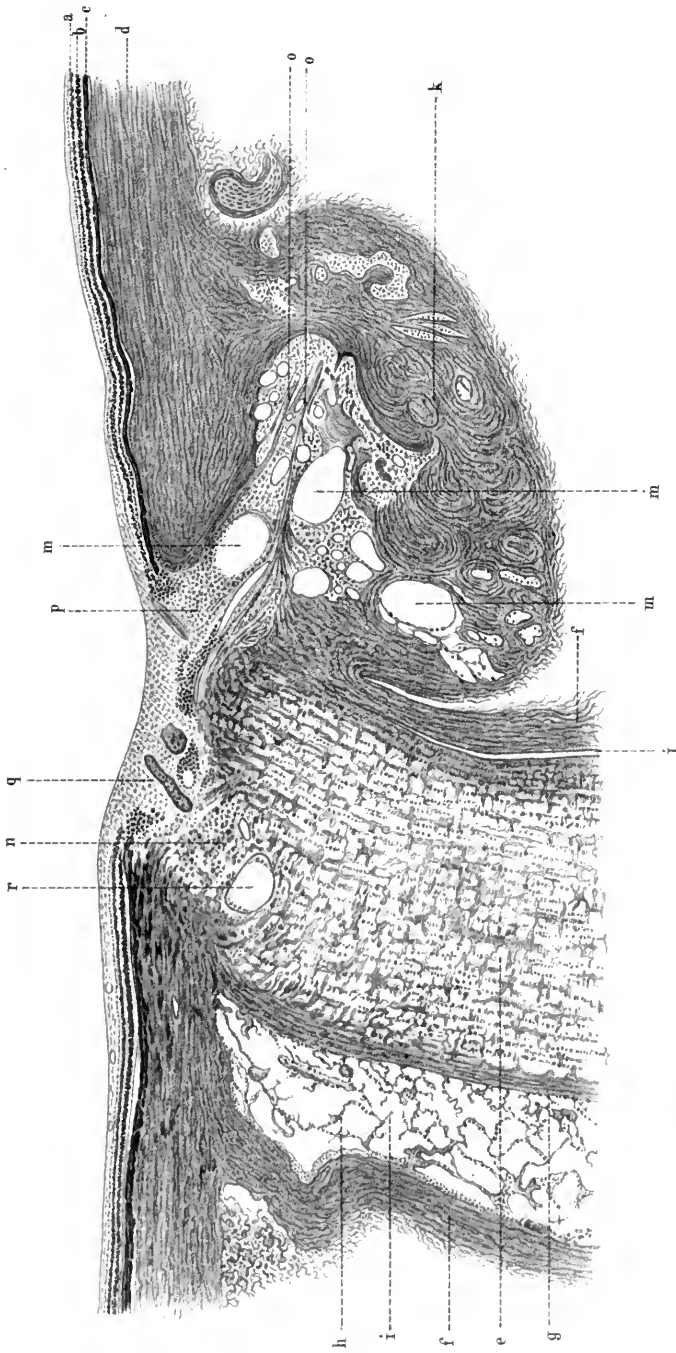


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Dr. M. Goerlitz, del.

ARCHIVES OF OPHTHALMOLOGY.

A CASE OF TRAUMATIC, AT FIRST DOUBTFUL,
ORBITAL SARCOMA, FOLLOWED BY ASEPTIC
THROMBOSIS OF THE CAVERNOUS
SINUS.SUCCESSFUL SINUS OPERATION BY DR. FRANK HARTLEY.
DEATH LATER BY THE EXTENSION OF THE PSEUDO-
PLASM. AUTOPSY. REMARKS.¹

BY DR. HERMAN KNAPP, NEW YORK.

(With five figures, the first four in text-plates VI.-IX., the fifth in the text.)²

Francis H. Cuffe, æt. thirty, New York City, admitted to New York Ophthalmic and Aural Institute, January 1, 1900.

History.—Five weeks previously the end of a billiard cue struck the ball and upper orbital margin of the left eye. The eye watered considerably for about ten days, without any other symptoms. The lids and conjunctiva began to swell and the eyeball protruded. Soon after, it receded somewhat, but since December 25, 1899, the protrusion has been more pronounced.

Condition on Admission.—The lids are swollen; the eye is pushed forward and down; its mobility restricted, most so upward, least outward; patient counts fingers at 20'; F. T. and pupil normal; media clear; periphery of optic disk and adjacent retina swollen; veins engorged, dark red (thrombosis of central vein?); no hemorrhage; arteries and veins pulsate on strong pressure; the upper lid hangs as an inert, dark-red mass of flesh over the eyeball; it feels soft on the nasal side, hard and somewhat uneven on the temporal; the hardness begins at the brow and extends uninterruptedly about 15 mm down; the patient is

¹ The first part of this article was communicated to the American Ophthalmological Society, May 2, 1900.

² Fig. 1 is from a photograph by Dr. Ch. M. Stevens, of New York, the three others from photographs by Dr. J. B. Solley, New York.

slightly apathetic, but gives reasonable answers when questioned. For years he has been hard of hearing on both sides; his drum-heads are pale, irregular, cicatricial, free from inflammation, but giving evidence of former purulent otitis media; the right ear is completely deaf; the left moderately hard of hearing.

The **probable diagnosis** is: injury of the roof of the orbit, possibly a fissure, with effusion of blood and serum; yet as there is no subconjunctival hemorrhage noticeable, the presence of a traumatic sarcoma is thought of. The patient is ordered to lie in bed, with sustaining diet.

Course of Disease.—*January 2d.*—Considerable chemosis; temporal margin of od free; the other parts ill-defined and swollen; on palpation no tenderness on any part of the orbit.

January 5th.—Fingers at 5'; less swelling of lids and conjunctiva.

January 6th.—Fingers at 8'; veins of retina dark and swollen; arteries and veins pulsate on light, and empty on strong, pressure.

January 8th.—Od and retina more swollen; chemosis greater on lower side; fingers at 4', excentrically.

January 9th.—Neuro-retinitis; movements of hands only. Incision into nasal part of the upper lid liberates little serum.

January 10th.—Pupil large; fundus reflex normal; no details recognizable; left eyeball immovable.

January 19th.—Hearing of left ear weaker; the swelling of the lids and conjunctiva slowly increasing.

January 21st.—The skin of the left side of the face, the left anterior half of the forehead and scalp, and the anterior surface of the left auricle show diminution of sensibility; cornea sensitive; dull in lower part, which is exposed.

January 30th.—Keratitis from lagophthalmos.

February 18th (see Fig. 1).—The condition of the lid and conjunctiva essentially the same; patient more apathetic; the whole region of skin supplied by the first division of the fifth pair now anæsthetic; the cornea is sloughing; iris prolapsed in lower part; temp. 98.6° ; pulse 68, normal in character; sensibility of mucous membrane of mouth and nose preserved. From right ear slight discharge at times; from left none. Fundus, S., and F. of right eye normal; no signs of inflammation in either ear.

Extended Clinical Diagnosis.—Œdema of the lids and conjunctiva, exophthalmos; diminution and gradual aboli-



FIG. 1.

tion of the mobility of the third, fourth, sixth, and anæsthesia of the first division of the fifth pair; the venous engorgement and œdema of the retina and the neuro-retinitis furnish sufficient evidence to assume the presence of thrombosis of the left cavernous sinus. As the most probable cause I assumed either a hematoma, compressing the ophthalmic vein, or a fissure of the roof of the orbit with injury to the sinus in a similar way as an arterio-venous communication in the cavernous sinus is brought about by a traumatic rupture of the carotid in the sinus, yet I thought that the presence of that rare and fatal disease of a traumatic palpebral and orbital sarcoma could not be excluded. In the latter case all surgical interference would be contra-indicated; in the former, the chances, according to our present knowledge, were scarcely less appalling. In the limited number of cases reported, the other eye nearly always became blind under the same symptoms as the first, namely, by extension of the thrombus from the cavernous sinus of one side to the other. Panas,¹ who collects the incident literature, counter-advises an operation, as only one case had been operated on before (by Horsley) and the patient had died eleven hours after the operation. Yet in our case I did not want to let misfortune continue its inexorable course, but was determined to have an operation performed as soon as there were symptoms of beginning thrombosis in the other eye. These symptoms soon enough made their appearance.

February 21st.—I made the round through the hospital at 2 P.M., as usual, examined our patient, particularly his right eye, for which I now cared chiefly. I found everything normal. At 4:30 P.M. the same day I showed him to a visiting physician. He presented a different picture in the right eye: œdema of conjunctiva, lids, and neighboring skin, slight but distinct protrusion of the eyeball, and swelling of the retinal veins; T., S., and F. normal. These symptoms diminished later, were almost gone the next day, but returned more markedly on the following days; abated, and reappeared again. Convinced that the case would follow the same course as the similar ones on record, I told the

¹ *Traité*, tome ii., p. 379.

patient and his father—both extremely sensible men—that in my judgment the other eye also was threatened with blindness, and only an operation could possibly prevent it. The operation, however, would not be without danger. Both father and son unhesitatingly said: “We are willing to take any risk to avert blindness.”

I went to Dr. Frank Hartley, one of the attending surgeons of the New York Hospital, of whom I knew that he had several times extirpated the Gasserian ganglion, and asked him whether he was willing to clean out a cavernous sinus (which I supposed to be obliterated by a non-infective thrombus), and prevent the thrombus from extending to the other, by ligating or compressing with a tampon the circular sinus. He seemed startled at first, but when I had told him the history of the case and he had examined the incident literature, and we had discussed the case together a second time, being convinced that total blindness and subsequent death would be inevitable, he said: “I will do it.” The greatest counter-indication was the possibility of the presence of a traumatic sarcoma, but this we could not yet assume with any degree of certainty.

The patient was transferred to the New York Hospital February 28th, and operated on there March 1st by Dr. Hartley in the presence of a number of physicians, myself included.

Dr. Hartley, on my invitation, was kind enough to be present at the meeting of the American Ophthalmological Society, at which he described the **operation** as follows:

“The patient was prepared in the usual manner for operation. The anæsthetic used was nitrous oxide and ether.

“An incision was made over the temporal region (Fig. 2.)—horseshoe in shape—and situated as in the operation for the extirpation of the Gasserian ganglion. The periosteum was divided in the line of the skin incision. The bone was divided by means of Doyen’s drill, Obalinski’s dural depressors, and Gigli’s wire saw, and in shape similar to an equilateral pentagon. The osteoplastic flap thus formed was raised and reflected over the zygoma. The dura mater was loosened from the squamous and pourest portions of the temporal bone sufficiently to recognize the second and third divisions of the fifth nerve and the middle meningeal artery at its entrance into the middle fossa of the skull. The middle meningeal artery was now divided. Its distal end was managed by compression beneath the brain retractor, while its proximal end was plugged with catgut in the foramen for its passage through the sphenoid bone.



FIG. 2.

"At this stage the dura mater was incised just above the cavity of Meckel, enclosing the Gasserian ganglion, which, being followed by the escape of cerebro-spinal fluid, allowed a greater field for the operative work. This escape of fluid allowed a very good field for work, but it implied that the retraction of the brain must be carefully and evenly carried out. The cavernous sinus was now located. In front of the junction of the second and third divisions of the fifth nerve the cavernous sinus was incised longitudinally as far as the sphenoidal fissure. No hemorrhage took place at this time, since the vein lumen was occupied by a clot, which filled it, and which was removed without difficulty, but not in its entirety. In incising this portion of the sinus wall, the division of the third and fourth nerves and the ophthalmic branch of the fifth was not thought to be of moment, since they had already shown evidence of paralysis.

"After the removal of the clot in this portion of the sinus a fine probe was passed into the sinus beneath the fifth nerve and toward the superior petrosal sinus. When this point was located, the incision in the cavernous sinus was extended and the remaining clot removed. The entrance of the superior petrosal sinus, which at first did not bleed, was seen.

"After assuring one's self that no portion of the clot remained in the cavernous sinus, the circular and the superior petrosal sinus were investigated carefully with a fine probe. From these sinuses blood soon flowed, but from the ophthalmic vein no blood escaped. The escape of blood from these two sinuses was thought to be sufficient and satisfactory to demonstrate their permeability. The walls of the cavernous sinus were now allowed to drop together, and, as they opposed very accurately, a small strip of sterile gauze was placed against them and over the entrance of the circular sinus. The end of this piece of gauze was brought out through the lower angle of the wound in the skull. This gauze was small in amount but very accurately applied over the sinus. The brain was now allowed to fill the fossa, which it did in about twenty minutes. There was no hemorrhage at this time. The osteoplastic flap was replaced and sutured, but in such a manner that the gauze could be easily removed on the third day without greatly disturbing the flap.

"The condition of the patient at the conclusion of the operation was good. He left the operating room in excellent condition."

The **subsequent history** of the case is as follows :

There was no affection of the right eye ; he could always see

well with it, and its outer aspect and the background remained normal. The left eyeball has sloughed, the tumor has continued growing steadily: at the margin it is nodular; it has encroached on the temporal side (Fig. 3), the region of the brow, and the glabella (Fig. 4). At the upper nasal corner it begins to slough (Fig. 3). The diagnosis of a traumatic sarcoma is evident, and as, according to general opinion, with which my own experience agrees, these tumors are never cured, and operations hasten rather than retard the fatal issue, I did not advise any further operative interference.

The course after the operation was almost free from fever during the first three weeks. When the tumor began to ulcerate, the temperature rose, varying between 100° and 103° . The pulse, accelerated during the first days, sank from 124 on the day after the operation to 80 and 72 in the next four days.

In the right eye nothing except swelling of the superior retinal vein was noticed during the first two weeks. Slight haziness of the background disappeared gradually so that the interior of the eye from the third day on could be pronounced normal. S., T., the aspect of the iris, and the behavior of the pupil showed no change during the whole course of the disease. The tumor grew steadily and assumed more and more the character of sarcoma. It extended beyond the superior orbital edge as well as over the temple, the root of the nose, and the glabella (see figures 3 and 4). Toward the temple its surface was uneven and nodular. The inner portion, which had been less consistent than the remainder from the beginning, showed in the third week softening and decay, steadily extending in breadth and depth and smelling offensive. The odor was mitigated by a moist dressing. The patient became more and more apathetic, his hearing decreased, he was drowsy and weak, and **died comatose** May 16, 1900. His vision remained good as long as he was conscious.

The **autopsy** was made in my presence by Dr. G. P. BRIGGS, the pathologist of the hospital, the day after death. Of his report I shall use what is of importance for our purpose. "The upper half of the nose, the left eye, the orbital tissue, and the adjacent soft parts of the face present a gray, necrotic mass, surrounded by an indurated thick margin, particularly marked on the temporal side. On section, the neoplasm looks more inflammatory than sarcomatous. The piece of bone temporarily resected by Hartley's operation is fastened by connective tissue in its



FIG. 3.



FIG. 4.

proper position corresponding to the field of operation, the dura is moderately thickened and slightly adherent to the skull. After detaching the anterior half of the left frontal lobe, a layer of cheesy material, like inspissated pus, of about $1\frac{1}{2}$ mm in thickness, is noticed on both sides of the greatly thickened dura. The thickening of the dura extends beyond the cribriform plate, and in part over the left temporal lobe. Otherwise the meninges are healthy. All the sinuses are normal except the cavernous, which cannot be demonstrated. The anterior surface of the right petrous bone and the adjacent portion of the squamous and mastoid portions are smooth but blackish, especially the roof of the tympanum. On opening, the whole interior of the right petrous bone was found uniformly filled with a slightly greenish, caseous material, while the surface of the bone is intact. The left petrous bone showed a circumscribed superficial corrosion on the lateral part of its anterior surface, whereas its interior structure is normal. The roof of the orbit and the cribriform plate are much corroded. The sphenoidal, ethmoidal, and frontal sinuses are filled with ropy matter. The convolutions of the left hemisphere are somewhat flattened. The left oculomotor and the left optic nerve, together with the left side of the chiasm and the adjacent left tract, are thickened. The lymph nodes of the left cervical region are enlarged. They constitute a mass of 5×2.5 cm."

The whole tumor, the unopened brain with the dura, and the two petrous bones were given to me and put at once for the night in a 5 %, then in a weaker, solution of formol.

I desire to add to this report the following observations based on the results of the examination of the hardened specimen. The tumor was found to be, at the place of its origin, the orbital roof, as in its whole quite large extent, a small- roundcelled sarcoma, which had softened and destroyed a part of the tissues it invaded. The orbital tissue was converted into a uniform sarcomatous mass, at the apex of which the shrunken eyeball was easily recognized by preserved remnants of lens, choroid, and sclerotic. The skin and subcutaneous tissue, with the exception of the epidermis, had been destroyed by the neoplasm. The bone in the anterior and horizontal portions of the frontal had mostly disappeared ; in the farther portions it was corroded.

The inner surface of the thickened dura mater, covering the orbital roof, presented an impression of the upper surface of the orbital roof. The outer side of this part of the dura mater and of the adjacent portions of the frontal lobe of the brain showed the same aspect. Under the microscope this mass consisted of an accumulation of more or less well-preserved, small, nucleated round-cells, which, in the harder portions of the tumor, appeared uniform and dense, with a very scant fibrillar matrix, in the softer parts irregular, lymphoid, and shrunken.

The dura was thickened by infiltration and covered on both its surfaces with spherical and conical sarcomatous proliferations. The fibrous structure of the dura was preserved and pervaded by the small sarcoma cells in quite the same manner as we see it so often at the sclera in small-celled melano-sarcoma. The surfaces of the corroded bone could be cut so as clearly to show the invasion of the sarcoma cells in passages, clusters, and diffusely, substituting the osseous tissue. Suppuration was nowhere noticed; the whole was cell proliferation and destruction of infiltrated tissue through molecular softening and decay. The presence of muco-pus in the accessory cavities of the orbit should not astonish us, for it is a constant companion of the malignant new formations which perforate the bony wall.

The **behavior of the chiasm** was remarkable. The proliferation of sarcoma cells had invaded the left optic nerve from its beginning so that it could not be seen in the orbit. The sarcoma after its perforation of the left orbital roof had extended to the cribriform plate, the adjacent bone and dura, and the contiguous cerebral substance up to, but no farther than, the entrance of the right optic nerve into its canal. Here a very peculiar picture was seen (see Fig. 5): the left optic nerve (*s*) was considerably thickened (8 mm in diameter, the right (*d*) being 4.5 mm), its color was reddish and its surface uneven, while the right optic nerve was uniformly smooth

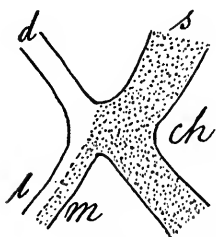


Fig 5.

FIG. 5.

and white, and continued its course unchanged up to the lateral side of the chiasm. From there on the *lateral* half (*l*) of the right optic tract preserved the appearance of the right optic nerve, whereas the *medial* half (*m*) of the right tract was reddish and distinguished by a sharp line from the lateral half. Not only the left optic nerve but also the left half of the chiasm (*ch*) and the left optic tract were broader and darker (reddish) than the corresponding half on the right side. To judge from appearance, the lateral fascicle of the right optic nerve continued its course strictly in its lateral direction, and the fascicle (*m*) which joined it on the left side of the chiasm on its way farther back was, apparently, derived from the left optic nerve. It was only slightly broader but a little more colored than the uncrossed fascicle (*l*) of the right nerve. At the left tractus no such differences could be made out by the naked eye. The picture seemed to furnish a conclusive example of the semi-decussation. Loath to spin out this article too long, I examined the chiasm and the two nerves only cursorily; the left was pervaded by sarcoma cells. The beginning of the right optic nerve, which was situated at the limit of the extension of the pseudoplasm, likewise contained sarcoma cells, but not in great numbers. The specimen appeared macroscopically too valuable to destroy it by sections.

CONCLUDING REMARKS.

I. In regard to the *diagnosis* there was at first, I think, a pardonable uncertainty. The patient mentioned a blow with a billiard cue to the lid and upper orbital margin, but did not feel any inconvenience from it during the first two weeks; then the upper lid swelled, became evenly red, and hung inert over the protruding movable and well-seeing eye. Then conjunctival œdema, exophthalmos, stasis of the retinal veins, neuro-retinitis, progressive impairment of motion up to complete stiffness of the eyeball, gradual diminution of sight, keratitis from exposure of the cornea, shrinkage of the eyeball, and insensibility in the region supplied by the first division of the fifth pair, made their appearance without

symptoms of fever. Locally there was neither spontaneous nor pressure pain. The temporal part of the dark red uniform swelling of the lid was hard, the nasal part soft. Consulting general and ophthalmic surgeons, among others Dr. Meding, who had sent the patient to the clinic, shared with me the uncertainty of the diagnosis, but thought that a traumatic extravasation of the orbit was the most probable cause, and recommended an exploratory incision in the upper-outer part of the orbit to relieve the tension of the tissues. I did not agree with this proposition, because a possible simple fracture might have been converted into a complicated one. Soon the formerly soft medial part of the lid-tumor began to become still softer, almost to fluctuate. An exploratory puncture let out a small quantity of bloody serum. The diagnosis was not made certain by the puncture, but made it incline toward a traumatic sarcoma. I remembered two cases in children who showed the same symptoms after a blow and both died of sarcoma of the lids and orbit. In the one, the centre of the lid-tumor was softer, redder, and showed a rhythmical bruit on auscultation, which impressed on my mind the diagnosis of a traumatic, palpebral aneurism. I took the child to one of our most experienced surgeons, Dr. W. MCBURNEY, at the Roosevelt Hospital. He said: "That looks like aneurism, and on account of this probability I shall try to expose it, but the possibility of a traumatic sarcoma cannot be excluded." I was present at the operation. The place where the bruit was heard was a focus of softening in a lardaceous sarcoma. As soon as Dr. McBurney saw this he desisted from the operation. The child died in about two months. A very similar case without aneurismal bruit was brought to me by the mother of the diseased child.

The partial softening of sarcomas easily leads us to mistake these tumors for cysts. Such a case I communicated to the Ninth International Ophth. Congress at Utrecht in Aug., 1899.¹ The tumor was situated above the inner cauthal ligament and presented itself, after eversion of the

¹ H. Knapp, *Trans. Ninth Internat. Ophthal. Cong.*, Utrecht, 1899. "Some Rarer Orbital Tumors. Five Cases."

upper lid, as a very soft, bluish intumescence which I took to be a serous cyst, extirpated it unbroken, put it in formol, and when I examined it later on was astonished to find it uniformly hardened. It was a small-celled sarcoma surrounded by a thin connective-tissue capsule.

Concerning the uncertainty of diagnosis I may be allowed to cite two places of the excellent *Traité des Maladies des Yeux* of Panas¹: "Certains sarcomes sont fluctuants, et une fois ponctionnés ils laissent écouler du liquide sanguinolent ou citrin d'où la possibilité de les confondre avec des kystes.

"Comme souvent un traumatisme précède l'évolution du néoplasme et que parfois l'une ou l'autre paupière devient spontanément échyмотique, on peut penser à tort qu'il s'agit d'hématome."

II. With regard to the *indications* and the *prognosis* I refer to what I have said in the history of the disease, page 464, under "Extended Clinical Diagnosis."

III. The *prognosis* suggests some further scientific and practical remarks. At the post-mortem examination, the thrombosis of the cavernous sinus could not be demonstrated, for the sinus had disappeared in the process of destruction by the progressing pseudoplasm. During the operation, which I watched very carefully, the sinus presented itself in the same manner as we see it in operations on the mastoid, when it is totally or partially occupied by a non-infected thrombus. The sinus, slit open, showed an uneven calibre, in the midst of which there were two oval black thrombi, which could be easily removed, whereas on the sides the sinus wall was thickened by dull-yellow, stratified, non-removable deposits — organized thrombus.

The thrombus was aseptic, for during life the symptoms of pyæmia and at the post-mortem examination the conditions produced by septic thrombosis — purulent disintegration of the contents and walls of the sinus, serous and purulent meningitis — were absent. Sometimes we have an opportunity to see with the ophthalmoscope a miniature picture of

¹ Panas, *Traité*, tome ii., p. 445.

aseptic coagulations in the veins of the retina; by exact adjustment in the upright image we notice an oval black deposit, immovably adherent to one side of a vein, whereas between the deposit and the opposite wall of the vein there is a small, brighter interval which I take to be flowing blood.

On both sides of the obstructed cavernous sinus there were obturating thrombi, namely, in the circular and superior petrosal sinuses. A blood current could be produced only by passing probes into these two sinuses, an observation with which aurists are quite familiar in septic thrombosis of the sigmoid sinus. The rapid, almost sudden, appearance of the symptoms of thrombosis, from one cavernous sinus to the other, which showed itself so marked in our patient, is also mentioned by Panas.¹ "Un caractère à peu près constant de la thrombose primitive du sinus est la bilatéralité de l'exophthalmie qui se produit en quelques heures, ou d'un jour à l'autre, au milieu d'accidents cérébraux graves." The presence of grave cerebral symptoms was, however, not noticed in our case, but merely ocular symptoms, and these were not constant, but intermittent during the seven days between their first appearance and the operation. Evidently transient and incomplete thromboses developed, and during the last days the grave symptoms were almost altogether wanting, probably because by the formation of obturating thrombi in the circular sinus, which were demonstrated during the operation, the blood current from the cavernous sinus and the orbito-ocular veins was no longer interfered with from the diseased side, constituting an intermission frequently noticed in sinus thrombosis.

In its kind the tumor was found to be a *small-celled sarcoma* with infiltration and extensive destruction in the neighboring tissue. The roof of the orbit was covered on both sides with a layer of a white, soft substance; the uneven thickness and small-pitted surface gave it an exquisitely corroded aspect. The grumous deposits were slightly moist, resembling necrosed tissue rather than inspissated pus. I

¹ *Traité*, tome ii., p. 379.

have sufficiently dwelt upon the propagation of the sarcoma to the neighboring parts, and the changes produced by it. Whether the sarcoma was really produced by the blow of a billiard cue I can of course not demonstrate, but there was no other assignable cause, nor the presence of sarcoma in any other part of the body.

IV. The presence of an *aseptic thrombosis* in the cavernous sinus was a *matter of direct observation* for me and all that were near enough during the operation. If it had been caused by a chronic suppuration of the middle ear we would have had to deal with an entirely different picture of disease and autopsy. The above-mentioned symptoms would have been accentuated by those of pyæmia: chills, steep-pointed pulse-charts, pus in the sigmoid and petrosal sinuses, purulent meningitis. Nothing of the kind was to be noticed. What was the true or at least the most probable cause of the thrombosis, the injury or the sarcoma? Either may have been the cause. The most probable supposition seems to be that the injury caused the sarcoma, and the sarcoma by pressure on the orbital tissues caused the thrombosis of the ophthalmic vein and the cavernous sinus.

V. What *practical applications* may be derived from the above observation for the diagnosis, prognosis, and treatment of similar cases? For the diagnosis, the case has the value which an important, unusual, and complete observation always possesses. The prognosis of the traumatic sarcoma of the orbit is hopeless in general. I do not believe that we could have saved the patient if we had made the correct diagnosis at the beginning. For *treatment* the case is eminently *valuable*, for Dr. Hartley's skill has demonstrated how the sinuses in the anterior part of the base of the skull may be reached. The method of osteoplastic resection, in this almost inaccessible neighborhood, simultaneously practised and made known by Hartley and Krause, may be applicable not only in the rare cases of aseptic thromboses of the cavernous sinus, but also on the infective otogenous thromboses.

SPASMODIC ACTION OF THE OBLIQUES IN CASES OF ABDUCENS PARALYSIS.

By ALEXANDER DUANE, M.D., NEW YORK.

IN the May number of the ARCHIVES OF OPHTHALMOLOGY, Dr. Wolff has described an interesting case in which with paralysis of the external rectus there were retraction movements of the affected eye. As Dr. Wolff says, this same case had already been reported upon by Kunn, who, apart from the retraction movements, gave a very accurate and elaborate description of it.¹

It so happens that I myself have examined this very case on three separate occasions, and, while my findings essentially agree with those of the two observers just cited, it has seemed to me that the significance of one feature that it presented has escaped them both. I refer to a spasmodic action of the inferior oblique, producing a marked upward deflection of the eye when rotated inward. I have observed a similar action in two other cases, in both of which there was also a paralysis of the external rectus. In view of the peculiarity of the conditions presented, a report of them may be of interest.

CASE I. Congenital Paralysis² of Left Externus with moderate Paresis of Left Internus (particularly marked in binocular vision). Spasm of Left Inferior Oblique.— Louise M., aged nineteen. Conditions noted have existed since early childhood, and probably since birth. Interior and vision normal.

¹ *Beitr. zur Augenheilk.*, xix., 1895.

² For the sake of brevity, the word "paralysis" is used to denote insuperable restriction of movement, whether due to defective innervation, or to non-development of the muscular fibre, or to any other cause.

When attempts are made to perform associated parallel movements with both eyes uncovered, the right eye apparently moves normally in all directions, although extreme movements, especially outward, are performed with effort, and, in the case of the outward excursion, are attended with nystagmus-like oscillations. In the horizontal plane, **left eye** can move outward only as far as the middle line or a short but varying distance beyond it. In the lower field, it can move outward rather more, and *in the upper field more still*, so as to perform quite a degree of excursion up and out. Movements of left eye up and down normal, but *as eyes ascend the left eye turns out*, the divergence being pronounced both when the patient looks straight up and also when she looks up and to the right or up and to the left. Excursion of left eye inward deficient, inner edge of cornea just touching caruncle. As left eye is carried inward, *it shoots obliquely upward*, and at the same time lids contract so that cornea is half buried beneath the upper lid. This oblique upward movement, already pronounced in the horizontal plane, *i. e.*, when the attempt is made to carry the eyes straight inward, *becomes still greater above the horizontal plane, i. e.*, when the eyes are directed upward as well as inward, and on the contrary *diminishes markedly when the eyes are directed downward*. It is equally apparent if the contraction of the orbicularis is opposed by lifting the left eyelid with the finger while the patient rotates the eye in. This upward deflection, while marked in all three examinations, evidently varies in amount from one time to another in the same way that the diplopia does (see below).

In the left half of field, there is homonymous diplopia, beginning in the primary position (sometimes a little to the right of it, sometimes a little to the left) and increasing fast as the eyes are carried to the left. When looking up and to the left, there is single vision, giving place to homonymous diplopia as the eyes are carried still farther to the left. The same is true for downward directions of the gaze, except that here homonymous diplopia begins to be apparent sooner as the eyes are carried to the left. No vertical diplopia in the left half of the field of fixation.

In right half of field of fixation, crossed diplopia beginning at from 5° to 10° from the primary position, and increasing fast as eyes are carried to right. *Vertical diplopia* with the image of the left eye below (left diplopia), *increasing as the eyes are carried to the right*, and becoming great when eyes are carried *up and to the right*. When eyes are directed to the right and then are carried

down, the vertical diplopia *diminishes as the eyes fall below the horizontal plane*, and ultimately becomes zero. The amount of vertical diplopia varies at different examinations, but is always marked, the vertical distance between the images in the upper left-hand field being as much as 25 centimetres when the test object is 1 metre from the eyes, representing an actual deviation of $10-12^{\circ}$ ($= 23^{\circ}$ of prism).

The range of movement of each eye singly is shown in the accompanying measurements of the field of fixation, taken with the perimeter and double dot.¹

FIELD OF FIXATION.

	JUNE 15.		JULY 16.
	Right Eye.	Left Eye.	Left Eye.
Out.....	68°	20°	20°
Out and 30° up.....	—	—	25°
“ “ 45° up.....	55°	15°	—
“ “ 60° up.....	—	—	30°
“ “ 75° up.....	—	46°	40°
Up.....	38°	36°-42°	40°
Up and 15° in.....	—	46°	40°
“ “ 30° in.....	—	—	40°-48°
“ “ 45° in.....	48°	35°	—
“ “ 60° in.....	—	—	44°
In.....	56°	35°	42°
In and 30° down.....	—	—	40°
“ “ 45° down.....	45°	38°	—
“ “ 60° down.....	—	—	48°
Down.....	68°	58°	69°
Down and 30° out.....	—	—	30°
“ “ 45° out.....	70°	24°	—
“ “ 60° out.....	—	—	20°

These measurements indicate that in *monocular fixation* there is great restriction of the movement of the left eye outward, moderate restriction of movement inward, and restriction of movement of both eyes downward and inward. Movements of left eye upward normal,² and, if anything, increased upward and inward.

¹ This test, which seems to combine precision with accuracy, is made by fixing the patient's head firmly in such a way that the eye examined occupies the centre of the perimetric arc and when in the primary position is directed at the zero of the scale. Keeping it in this position, the examiner carries along the perimetric arc a card having upon it two fine dots set close together. The patient follows the card with his eye without moving his head. The moment that he fails to follow the card, the two dots, being no longer sharply fixed by the eye, will appear in diffusion circles and hence will blur into one. Therefore, all that we have to do in order to ascertain the limit of excursion in any one direction is to find at what point of the arc the two dots can no longer be seen separate but appear to run into one.

² Upon what grounds Kunn (*l. c.*, p. 157) diagnosticated a paresis of the left elevators in this case, I am at a loss to say. There is absolutely no evidence of such a paresis now.

In performing *convergence with both eyes uncovered*, the right eye fixes and the left diverges; the near point of convergence being about thirty-two centimetres from nose when the eyes are directed straight ahead, twenty-five centimetres if the eyes are directed 5° to the left, and sixteen if the eyes are directed 10° to the left (insufficiency of action of left internus).

If *convergence is performed with the right eye covered*, left eye can turn in upon object of fixation until the latter is not more than five centimetres from the nose and the inner edge of the left cornea is considerably inside of the caruncle.

It is thus apparent that both for parallel and convergent movements the left eye moves much *better when the right eye is excluded* than it does in binocular vision. The same is true to a less extent of the right eye.

Here there was evidently a nearly complete paralysis or, more properly speaking, inaction of the external rectus. This inaction, which Kunn with reason regards as congenital, was probably structural, being due to non-development of the externus itself. There was also a marked insufficiency of the internus. This was much more pronounced for binocular than for monocular vision and is hence to be regarded as a paralysis of movement¹ rather than a paralysis of the muscle, *i. e.*, is due to an affection of one of the association centres and not to any impairment either of the muscle itself or its supplying nerve.² In addition there were the peculiar behavior of the orbicularis and the peculiar retraction of the eyeball, to which Wolff has called attention, but which, I may say, were little pronounced when I examined the case.

For the *marked upward deflection* occurring in the left eye whenever it was turned inward, Kunn offers no explanation. Wolff suggests that it is due to the resistance offered by the optic nerve to the backward movement of the eye as the latter is retracted into the orbit—the eye being, so to speak, squeezed between two opposing forces, which, because they

¹ Blicklähmung (Kunn). (Fixation paralysis.)

² Wolff's theory that the restriction in adduction was purely mechanical does not seem compatible with the fact that this restriction was less marked for monocular vision than it was when both eyes were used, and in the latter case was much greater for convergence than it was for associated parallel movements. If purely mechanical it ought to have been the same under all conditions.

are not precisely in line with each other, tend to thrust it upward.

That this explanation is at all adequate I cannot think. The resistance offered by a flexible body like the optic nerve must be slight indeed and could scarcely be constant in character and direction. The deviation due to it, therefore, would be irregular and subject to sudden variations, and not marked by the uniform steady increase in the upper field and the uniform steady decrease in the lower field shown in the present case.

The vertical deflection might be ascribed to an anomalous insertion of the internus, causing it to act partly as an elevator; but a similar objection to that made against Wolff's hypothesis applies here—namely, that a deviation due to this cause would not be essentially greater when the eyes were directed up than when they were directed down.

Furthermore, neither theory accounts at all for the singular fact that the left eye, in spite of the almost complete inaction of its externus, diverges markedly and progressively as the eyes are elevated, and when elevated can be abducted to quite a considerable degree.

On the other hand, all the conditions are explained upon the hypothesis of an *excessive spasmodic contraction of the inferior oblique*. Such a contraction would tend to carry the eye upward, and the more so in proportion as the eye is turned inward. The ability of the inferior oblique to carry the eye upward, moreover, would increase steadily in the upper field of fixation and diminish steadily in the lower field. Again, when the eye was carried upward, and especially when it was carried upward and outward, the abducting action of the inferior oblique would come into play, and if excessive would cause the eye to diverge in spite of the co-existing paralysis of the externus.¹ Furthermore, in upward and especially in upward and outward directions of the gaze, the abducting action of the inferior oblique, if excessively

¹ The divergence observed in the left eye when looking up and to the right cannot be ascribed to this spasmodic action of the inferior oblique, since this muscle does not act as an abductor when the eye is directed up and in. It is evidently due to the simultaneously existing insufficiency of the left internus. The divergence of the left eye in looking down and to the left is probably due to a similar but slighter action of the superior oblique.

exerted, would enable the eye, as in this case, to move outward moderately even in default of any action of the externus.

The character of the diplopia and the way in which it increases and decreases, as also the manner in which the field of fixation is restricted, are strictly in accord with this hypothesis.

The fact that the diplopia and deviation varied in amount from time to time while always preserving the same character lends probability to the assumption of its spasmodic origin.

It may be added that A. Graefe¹ has cited an instance of a complete paralysis of the externus in which the obliques acting alone were able to produce a moderate amount of abduction of the eye when the latter was directed up and down, but not, of course, when directed horizontally. In a case of incomplete paralysis of the externus, in which the eye could be abducted somewhat while still in the primary position, this compensatory action of the obliques would come much more markedly into play, since the abducting power of the obliques increases with the degree of abduction of the eye.

An altogether similar case is that of the sister of the foregoing, likewise cited by Kunn² and Wolff.³

Also similar is a case given by A. Graefe⁴:

Eight-year-old boy with complete paralysis of the left externus existing since infancy. If the object of fixation is carried horizontally to the right, and both eyes are made to follow it, there is marked contraction of the left palpebral fissure, while *if the object is carried up and to the right the left eye moves upward excessively*.

And Kunn⁵ gives a case which, while not precisely parallel to those cited, yet is similar in that it is apparently a case of spasm of both elevators (principally the inferior oblique) of the left eye:

¹ Graefe-Saemisch, *Handbuch d. ges. Augenheilk.*, 2d ed., Bd. viii., Kap. xi., p. 88, Case 13.

² *L. c.*, p. 63.

³ *L. c.*, p. 300, Case 4.

⁴ *L. c.*, p. 87, Case 6.

⁵ *L. c.*, p. 68.

Seventeen-year-old boy. When the two eyes are examined separately, the eye not under examination being kept closed, the abduction and adduction are found to be limited in the right eye, and absolutely *nil* in the left—*i. e.*, with the right eye closed, the left eye remains perfectly motionless when the attempt is made to get it to follow an object carried to either the right or the left. But when the same attempt is made with both eyes open, and the eyes are directed to the right, the *left eye flies straight upward* until nearly the whole pupil is buried beneath the upper lid. The left palpebral fissure at the same time contracts and the patient wrinkles his forehead. In looking up, both eyes move well, but the *left moves up better* than the right. In looking down, on the contrary, the right moves better.

My own cases in addition to the one cited are the following, which have been elsewhere reported¹:

CASE 2. Paralysis of Left Externus; Spasm of Left Inferior Oblique. Bertha S., aged eight. Deviation of eyes noticed since birth. Used to hold head to right and does so still when looking intently at anything. Left eye cannot move out beyond median line. *When eyes are carried horizontally to the right, left eye suddenly flies upward* and becomes buried beneath the upper lid. *If the eyes are directed down and then carried to the right, left eye does not fly up*, but moves on same plane as the right. Behind screen, left eye deviates high up and somewhat in. No double images attainable.

CASE 3. Paralysis of Right Externus; Spasm of Right Superior Oblique. Emma D., aged fifteen. Strabismus since scarlatina eleven years before. Occasional vertigo; no diplopia. Right eye deviated inward, and when screened moves downward. Movements of left eye normal. When both eyes are directed to the right, right eye cannot move out beyond middle line; nor does it move up at all when the eyes are directed up and to the right. Movement of right eye almost normal when eyes are directed up and to the left (retention of power of the inferior oblique); movement downward excessive, especially when eyes are directed downward and to the left (excessive action of superior oblique). When attempt is made to move eyes straight to left, right eye shoots obliquely down and to the left (spasmodic action of the superior oblique).

¹*Motor Anomalies of Eye*, pp. 54, 55.

That the downward deviation of the right eye in this case was due to the overaction of the superior oblique and not of the inferior rectus is evident from its marked increase when the eye is turned inward — a direction of the gaze in which the inferior rectus has little power as a depressor.

Not associated with a paralysis of the externus and hence not strictly analogous to these cases but still of kindred nature, is the case I have reported,¹ in which to the ordinary evidences of a paralysis of the left superior oblique there were, after a time, superadded symptoms of spasm of the left inferior oblique — *i. e.*, in movements up and to the right the left eye rose higher than the right, and when the attempt was made to carry both eyes straight to the right, the left eye shot obliquely up.

The overaction of the obliques in the cases cited is probably *compensatory in character* — *i. e.*, the abducting action of the obliques is called into play to an excessive degree to replace as well as may be the defective abducting action of the externus. There is, however, another possibility. In marked retraction of the eyeball, the tendons of the obliques will be put on the stretch, and the tendons of the recti will be relaxed. If the retraction takes place to the extent that Wolff believes, the effect of the obliques may be so heightened by the extra tension, and the effect of the recti so diminished by their relaxation, that a relative excess of action of the obliques may be developed. This theory, however, hardly accords with the facts in Case I, in which the overaction of the inferior oblique was evident in directions of the gaze (up and also up and to the left) in which there was no retraction of the eyeball. Moreover, the absolute amount of retraction shown by the case when I had it under observation was slight, and, I am inclined to think, more apparent than real—the appearance of refraction being simulated by the contraction of the orbicularis.

It may be added that the existence of a vicarious action of the obliques producing a certain amount of abduction even in complete abducens paralysis has long been noted—*e. g.*, by J. Soelberg Wells,² and also by Streatfeild,³ although the

¹ ARCHIVES OF OPHTHALMOLOGY, xxvi., 3 (1897), p. 325.

² *Ophthalmic Hospital Reports*, II. (1859).

³ *Ibid.*

latter gave an erroneous interpretation to the phenomenon. Such a vicarious action is shown by spasmodic outward movements of the paralyzed eye somewhat beyond the middle line, the eye at the same time moving in a zig-zag direction up and down. This action is of the same nature as that presented in the cases here cited, differing, however, in being transient in character and but moderate in degree.

THE CHROMOSCOPE: A CONVENIENT INSTRUMENT FOR STUDYING THE COLOR SENSE OF THE MACULA LUTEA AND ITS ANOMALIES.

BY PROF. M. KNIES, FREIBURG-IN-BADEN.

(With three figures in the text.)

Translated by Dr. WARD A. HOLDEN.

WHILE studying certain anomalies of the color sense it seemed to be advisable to determine the limits of the various colors in the spectrum as seen by persons with normal and abnormal color-perception. An examination of this sort is usually considered unreliable. It was soon discovered, however, that the variations when a single individual was tested, myself for example, were very slight. With different individuals, even when their color perception is perfect, the statements as to the limits between the different colors vary much more, within certain bounds indeed, but not such narrow ones that the variation can be supposed to depend upon errors of observation alone. Corresponding to this we find that the limits of the various colors in the spectrum have been differently stated in the literature where theoretical considerations have also come into play.

I began with experiments on myself, using a Bunsen spectroscope and an Auer burner. The first purpose was to determine the limits of the spectrum as regards the perception of color only. Luminosity and width of slit have their influence, but for the comparison of various eyes I employed an arrangement with which the red end of my spectrum fell at 173 of the arbitrary scale (the sodium line D being taken as 200) and the violet end at 293. For my own eye red has its

greatest intensity at 189.5 and violet at 276. The boundary between reddish yellow and greenish yellow (neutral yellow) lies at 202; that between yellowish green and bluish green (neutral green) at 215.5; that between greenish blue and pure blue (sea blue) at 228. In Fig. 1 these results are given in a graphic manner. The markings represent the average of half a dozen observations, the variations, however, being very slight.

The division into colors is of course quite different if we transpose the arbitrary scale of the spectroscope into wave-lengths. In Fig. 1, above the horizontal line are given the spectrum lines, with the help of which this transposition was made. We obtain then the following wave-lengths expressed in millionths of a millimetre:

1. Outer boundary of red.....	742
2. Greatest intensity of red.....	641
3. Boundary between reddish yellow and greenish yellow...	583
4. Boundary between yellowish green and bluish green.....	538
5. Boundary between greenish blue and pure blue.....	510
6. Greatest intensity of violet.....	528
7. Outer boundary of violet.....	404

In Fig. 2 these relations are given in a graphic manner, and this represents the division of the colors in the spectrum as they appear to over 90 % of all persons with normal vision.

The differences found in different individuals are so slight that when we take into account all sources of error, such as fatigue, the effects of contrast, and the like, the differences easily fall within the limits of errors of observation.

It would be too cumbersome in each case in which the color sense is examined to use a spectroscope. We can determine the more important fixed points in the spectrum (excepting neutral green) in a much simpler manner. When I look at a white strip on a black ground through a prism in such a manner that the well-known colored margins appear, while the middle of the strip remains colorless, I see the following: On one side of the spectral image red begins and, without markedly changing its hue, grows more intense and then passes over rapidly through orange to yellow, which fades

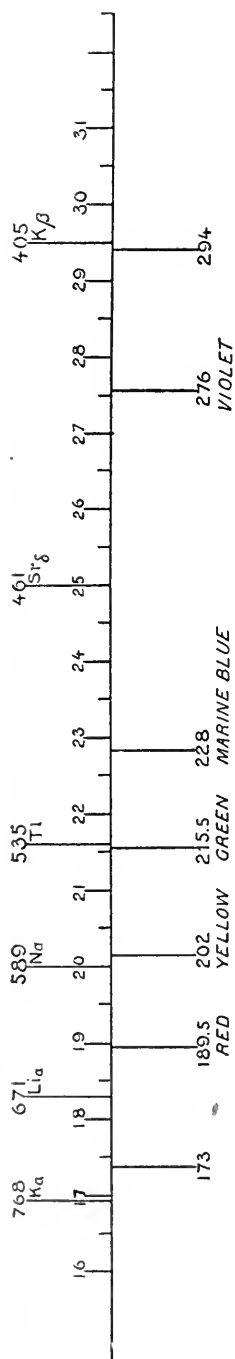


FIG. 1.

Location of the colors in my own spectrum, using the arbitrary scale $D = 200$; above the scale the spectral lines which served to transpose the limits into wave-lengths.

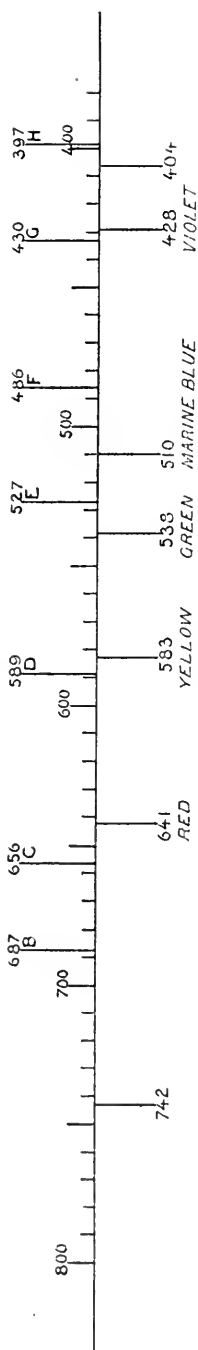


FIG. 2.

Location of the colors in my spectrum in wave-lengths; above the scale the lines B to H of the spectrum.

away into the white of the middle of the strip. On the other side of the strip I see the violet becoming more intense and then passing over rapidly through indigo to marine blue, which fades away to white toward the middle of the white strip. In other words, I see the spectral color λ 641 pass rapidly into λ 583, and the latter into white; while on the other side λ 428 passes rapidly into λ 510 and the latter into white. The spectral hues¹ between λ 583 and 510 are completely wanting.

In this way four principal colors are seen which correspond to the above-mentioned colors indicated as 2, 3, 5, and 6 in the spectrum, and can readily be matched with the colored yarns.

In order to carry out such examinations quickly and conveniently I have constructed a small instrument which I have called a chromoscope. This is essentially an arrangement for exhibiting the colored margins of a white strip without distracting the attention by any other spectral phenomena.

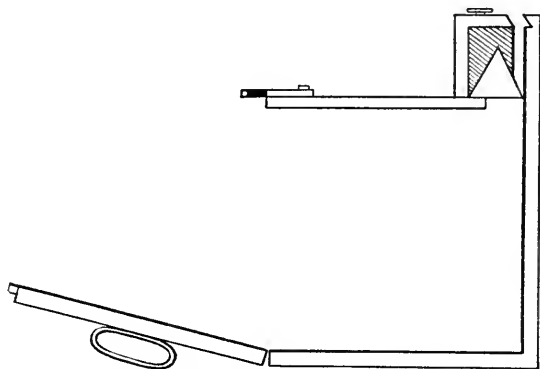


FIG. 3.—THE CHROMOSCOPE. ($\frac{1}{2}$ Natural Size.)

It consists, as shown in Fig. 3, of a box lined with black velvet, whose front side can be turned down nearly to the horizontal. On the opposite side, above, is a small projection on which is mounted a flint-glass prism having an angle of 60° . A strip of white paper 5–10 mm broad is viewed through the prism, one margin or the other being brought

¹The word "hue" is used throughout in translating the author's term "nuance," in the original, which of course refers to luminosity only and not color, literally meaning tint or shade.—TRANS.

into the field, and the patient is asked to select a skein of yarn similar to the color seen, without calling it by name.

Persons with a normal color-sense select the same hues as I do myself: the end colors of the spectrum, red and violet (any deviation here is abnormal and indicates a shortening of the spectrum), and then a neutral yellow and a marine blue. There may be a little uncertainty above the middle colors, and a greenish blue skein may be selected and even called green.

If now the observer's color sense is abnormal, other colors are seen and other skeins are selected which are characteristic for the sort of color-blindness existing.

What v. Kries found by painstaking examinations and measurements (*Zeitsch. f. Psych. u. Physiol. d. Sinnesorgane*, vol. xiii., p. 241), viz., that there are two sharply differentiated forms of congenital color-blindness: protanopes (red-blind) with a maximum perception in greenish yellow (λ 571) and blue (λ 480-460), and deuteranopes (green-blind) with a maximum perception in orange (λ 603) and blue (λ 480-460), can be discovered with the chromoscope at a glance. The affected person will select at once the proper blue and either yellow or reddish yellow.

It is very interesting to determine with the chromoscope those color anomalies which arise in progressive diseases of the optic nerve and similar processes. In the beginning four colors are chosen here also, but other than the normal colors. The two inner colors of the spectrum, yellow and marine blue or greenish blue, are normally perceived; but instead of red, yellowish red or, later, reddish yellow will be selected, and in place of violet, which is the first color to be lost, the patient selects various hues of indigo up to cyan blue. This indicates a shortening of both ends of the spectrum. So long as four distinctly different colors are recognized in the chromoscope, green will be recognized. Then the condition becomes such that only yellow and blue are seen, just as in congenital color-blindness, except that here the acuteness of vision also has suffered. The two colors seen in the chromoscope become gradually fainter until no color at all is seen in the middle of the spectrum. Actually perception of violet is lost first, then of green, then of red.

The examination with the chromoscope of course only gives us information as to the color perception at the macula. It must be supplemented with color perimetry, in which more attention should be given to tests with violet than has hitherto been done.

Examination with the chromoscope¹ has also led, as the following paper will show, to the discovery and accurate determination of a previously ignored congenital color-defect, a knowledge of which is of great theoretical importance, though its presence leads to but slight clinical symptoms.

¹ The chromoscope may be obtained from Carl Kramer, Friedrich Strasse, 15, Freiburg-in-Baden.

ON A FREQUENT BUT HITHERTO UNRECOGNIZED FORM OF CONGENITAL VIOLET-BLINDNESS AND ON COLOR ANOMALIES IN GENERAL.¹

BY PROF. M. KNIES, FREIBURG-IN-BADEN.

(With four figures in the text.)

Translated by Dr. WARD A. HOLDEN.

SOME time ago I described in the *Archiv f. Augenheilk.* (vol. xvii.) an anomaly of color perception in which violet is not seen, while the color sense is normal for the other colors of the spectrum. My report has been almost entirely ignored. It was not reviewed in Michel's *Jahresbericht* for 1887 because "it was not adequate to the present status of color examinations." If this means that it fits neither the Young-Helmholtz nor the Hering color-theory I have no objection to make; nevertheless such cases are not to be done away with simply by ignoring them.

This color anomaly is not particularly rare. Lucanus (*Arch. f. Augenheilk.*, xxi., p. 41), who, to my knowledge, is the only one who has taken up this matter, readily found half a dozen cases which he described. Personally, I regard it as quite as frequent as Helmholtz's red-green blindness or Hering's confounding of red and green. It will seem improbable to many that so pronounced a color anomaly should be so frequent, but here again we find that current theories under certain circumstances are not conducive to the discovery of truth.

This form of color anomaly is congenital and is character-

¹ Criticism of some of the statements in this and the succeeding paper may be found in Raehlmann's paper, *Zeitsch. f. Augenheilk.*, vol. ii.—TRANS.

ized by the fact that pure violet is not seen, however intense it may be, while the other colors of the spectrum are promptly recognized and rightly distinguished, excepting greenish blue and marine blue, which the patient has some difficulty in naming. In consequence of the invisibility of violet, red and purple are not distinguished from each other, both being called red. Even a hasty examination with the spectroscope reveals a marked shortening of the blue end of the spectrum. The acuteness of vision, field of vision, and light sense are normal in these cases unless there are complications which would cause functional disturbances even in the normal-sighted.

In ordinary life such persons are regarded as having normal color-perception. It would scarcely be remarked if they called "blue" the violet hues that in nature are rarely pure, for many people do this who have a correct appreciation of violet; nor if they called purple hues "red," as even Hering does in his color system. (The erythropsia or red vision of those who have been operated on for cataract would more correctly be called "purple vision.")

With Helmholtz's theoretical violet-blindness this anomaly, as is readily understood, has nothing to do. Nevertheless we are justified in calling such persons violet-blind, for they are just as blind for violet as the Helmholtz red-blind are blind for red. This violet-blindness is so complete that spectral violet, even in its greatest intensity, is not recognized as a color. There is this great difference, however, that the red- and green-blind see only two colors in this spectrum, while the violet-blind in their spectrum see all the other colors as do persons with normal color-perception, and each portion of their spectrum has a different hue. They must, like those with normal vision, possess at least three color components in order that each point in their spectrum can appear to be of a different hue.

A very pronounced case of this color anomaly which I have recently examined from every view-point furnished the occasion for this paper.

G. M., a physicist of repute, and a personal friend, told me years ago that in astronomical observations he had never

been able to see the violet stars. An examination with the colored wools revealed the defect in question: dark violet = black, purple = red, some uncertainty in the designation of greenish-blue and bluish-green colors, and quick and correct naming and differentiating of all other colors. Tints and shades of any color were properly arranged together, even when the color was purple.

Lately a careful examination was made with the following result:

$$R - 2. - 0.75c. // V = \frac{5}{8} +.$$

$$L - 2.5 - 0.75c. \backslash V = \frac{5}{8} +.$$

A slight conus in each eye; optic disc and surrounding fundus otherwise normal.

With the colored yarns the results agreed with those given above. With Stilling's charts, Nos. 2, 3, 4, 6, 7, and 10 were read easily, and Nos. 1, 5, 8, and 9 with somewhat greater difficulty. Ordinarily the examiner in such a case would have reported normal color-perception.

With the chromoscope "red and yellow" were seen at the red end of the spectrum, and "green and blue" at the violet end, and these colors were matched with the yarns, while I myself saw red and yellow at one end, and marine blue and violet at the other. The red selected by G. M. was a yellowish red, a fact to which at first I paid little attention.

For further examination I used a Bunsen spectroscope. I did not purpose to determine the utmost limits of the visible spectrum, but with a bright spectrum to determine the limits of color perception. For these experiments it seemed to me most fitting to arrange the apparatus so that the limit of violet lay at 244 of the arbitrary scale (the sodium line = 200). Under these conditions G. M. found that the limit of the blue end of his spectrum, whose color he called "blue," lay at 281. In Fig. 1, the results are given graphically, where the short lines below the scale refer to G. M., and the long ones to me.

It appeared further, although I had overlooked it before, that there was also a shortening of his red end of the spectrum (176.5 instead of 173). The shortening of the blue end was 13, while that of the red was only 3.5.

Further than this, the following determinations were made :

	KNIES.	G. M.
1. Greatest intensity of red or transition of red to orange.....	189.5	195
2. Limit between reddish and greenish yellow.....	202	202
3. Limit between yellowish and bluish green.....	215.5	214.5
4. Limit between bluish green and pure blue.....	228	225
5. Greatest intensity of color at blue end (See Fig. 4.)	276 (violet)	258 (blue).

Transposed into wave-lengths and expressed in millionths of a millimetre we find, as is shown graphically in Fig. 2 :

	KNIES.	G. M.
Red end of spectrum.....	742	718
1. Greatest intensity of red.....	641	623
2. Neutral yellow.....	583	583
3. Neutral green.....	538	541
4. Limit between bluish green and blue.....	510	516
5. Greatest intensity at blue end.....	428	451
6. Blue end of spectrum.....	404	421

We found, thus, that under these conditions the red end of G. M.'s spectrum was shortened 24, and the violet end 17, as reckoned in wave-lengths. But on account of the unequal division of the spectrum this color disturbance was chiefly manifested in the blue end of the spectrum. The portion of the spectrum which the normal-sighted name violet, is here almost entirely wanting. Neutral yellow appears at the same point for both of us, but the limit between greenish blue and pure blue is somewhat displaced toward the red end of the spectrum for G. M., thus being explained the fact that his naming of greenish-blue and bluish-green hues was not quite normal. That this error is less marked in the case of red and orange, is due to the fact that the reddish hues of orange, in the lack of a current German name, are usually called merely red. Here I may remark that this confusion is found as a transitory condition in the incipient

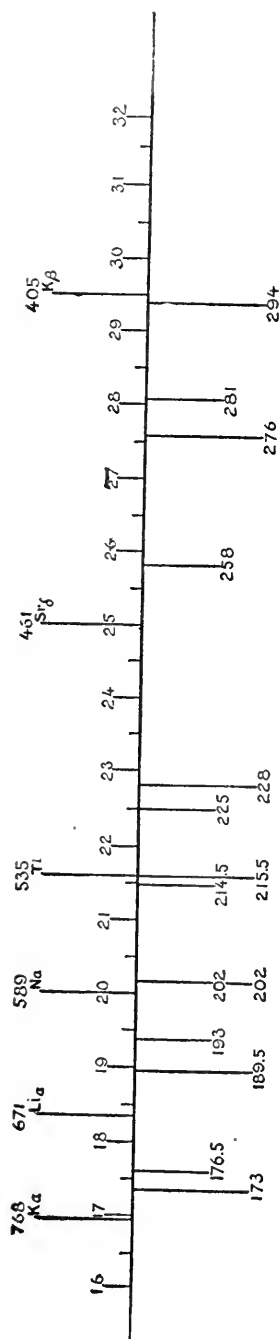


FIG. 1.

Location of colors in the spectrum as seen by G. M. (short lines) and by me (long lines); arbitrary scale ($D = 200$). Above are the spectral lines used in computing the wave-lengths.

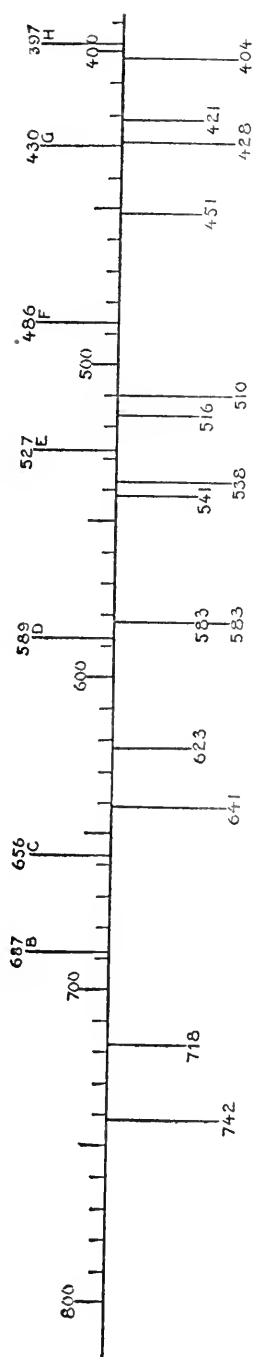


FIG. 2.

Location of colors as above reckoned in wave-lengths. Above the scale are the lines B to H of the spectrum.

stages of optic-nerve atrophy at a time when the acuteness of vision is still normal, red appearing as orange.

There can be no doubt but that the color system of G. M. is made up of other components than mine. The simplest examination of the color system of a person consists in determining accurately the limits of each individual color in the spectrum. For ordinary purposes the chromoscope suffices for this. The person with normal vision will see red (λ 742-641), yellow (λ 583), blue (λ 510), and violet (λ 428-404). The transitions between red and yellow, and between blue and violet, are not altogether wanting, but are inconspicuous. When G. M. was examined with the chromoscope he selected as equivalent colors a reddish orange, yellow, greenish blue, and indigo. These were exactly the colors which we both had called 1, 2, 4, and 5, in the spectrum (see *antea*). The point to be held fast here is that there are persons whose perception of violet is entirely wanting, while they are able to differentiate perfectly all the other colors in the spectrum. Such cases cannot be explained by the three-color theory, for if there be three fundamental color-perceptions, and one of these is proved to be wanting, three cannot remain, yet three are necessary in order that all the remainder of the spectrum be perceived as consisting of different colors.

This form of violet-blindness belongs to that class of facts which, like the processes in optic-nerve atrophy, cannot be made to accord with the Helmholtz theory of color perception. It seems to me in general that the proofs of the three-color theory proceed for the most part from the disproof of the Hering theory, whence, on the supposition "*tertium non datur*," the correctness of the former is supposed to be demonstrated. Thus v. Kries (*Zeitschr. f. Psych. u. Physiol. d. Sinnesorgane*, xiii., p. 241) has proved that Hering's confounders of red and green may be separated into two distinct classes between which are no transition forms, which of course would be impossible according to Hering's theory. But does this prove that the three-color theory is correct? If such color-blind persons possessed only two of Helmholtz's fundamental colors, viz., red, green, and violet, the

protanopes (red-blind) must have green and violet as fundamental perceptions, and the deuteranopes (green-blind) red and violet, called by both yellow and blue. Actually, according to v. Kries, the two forms have an almost exactly corresponding maximum of short-waved perception in blue (λ 480-46), and a maximum of long-waved perception in greenish yellow (λ 571) for the red-blind, and in reddish yellow (λ 603) for the green-blind.

The three fundamental colors can not, therefore, be red, green, and violet, but reddish yellow, greenish yellow, and blue; but these three colors would by no one be made the basis of a color system. However, the fact remains that there are two essentially different forms of the common color-blindness (those who see two colors only) in which the persons confound red and green, which, on the other hand, speaks against the correctness of Hering's theory. In the deuteranope there is wanting not simply a single component of normal color-vision, but the remaining two components differ from the normal. Without going farther, I will leave the matter to the adherents of the two theories to bring them into accord with the facts.

This violet-blindness, I repeat, is congenital, stationary, and not especially rare. In the ordinary tests for colors it escapes our notice, and it must be specially sought for, since a subjective sense of color disturbance is either wanting or very slight. Nevertheless, certain observations may lead us to suspect its presence. I am convinced that Prof. Becker was violet-blind, and it should always awaken suspicion when one calls visual purple "visual red." Perhaps even Hering is not free from this defect.

Lack of sufficient material prevents me at present from determining in how far transition forms between normal color-perception and that of G. M. exist as congenital anomalies, but as transitory conditions in optic-nerve diseases such forms occur.

If a violet-blind patient has an affection of the optic nerve, the visual and color disturbances run the same course as in persons with normal color-perception. A case of this sort (unilateral traumatic atrophy of the optic nerve becoming

stationary) has been previously reported by me. With the affected eye the patient called the two colors that he saw in the chromoscope "red" and "blue," and matched them with orange and blue yarns; with the healthy eye his color perception was exactly similar to that of G. M.'s eyes.

There remains the supposition that in the form of violet-blindness described, components of the color system are present other than those existing in persons with a normal color-sense, and that these components lie closer together than the components in persons with a normal color-sense; but that within the shortened spectrum of the violet-blind the same relations exist as in persons with a normal color-sense. Whether the number of fundamental perceptions is three or four, one must hold to the idea that the fundamental perceptions are to be sought in the same parts of the spectrum in all individuals, and that color disturbances arise only through diminution in intensity or complete absence of definite fixed fundamental colors.

The symptoms of acquired progressive color-disturbances can only be explained by supposing that in the person affected the fundamental perceptions change their location in the spectrum, and two unite to form one.

I have already mentioned my so-called chromoscope, a device in which a white strip is seen through a prism, while outside objects are cut off from view. This chromoscope has proved in my hands to be the most convenient instrument for determining quickly and accurately the color sense of a person. All who have more than two fundamental color-perceptions with this instrument see practically only four colors, which lie in the spectrum at λ 641, 583, 510, and 428; for G. M., who is violet-blind, the four colors seen lie at λ 623, 583, 516, and 451. From this it appears that the four colors seen consist of two pairs of complementary colors; for me λ 641 and 510, λ 583 and 428 are complementary, and for G. M., λ 623 and 516, λ 583 and 451 are complementary. For me, red and marine blue, yellow and violet; for G. M., reddish orange and greenish yellow, yellow and indigo. The complementary color of yellow λ 583 is, for me, violet λ 418; for G. M., indigo λ 451. Thus the complementary colors

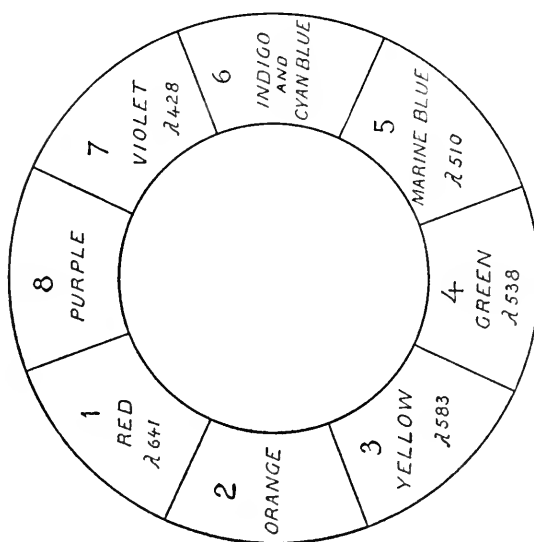


FIG. 3.

A color circle composed of the chromoscope colors as I see them, and the combinations of them in pairs as they lie near each other in the spectrum.

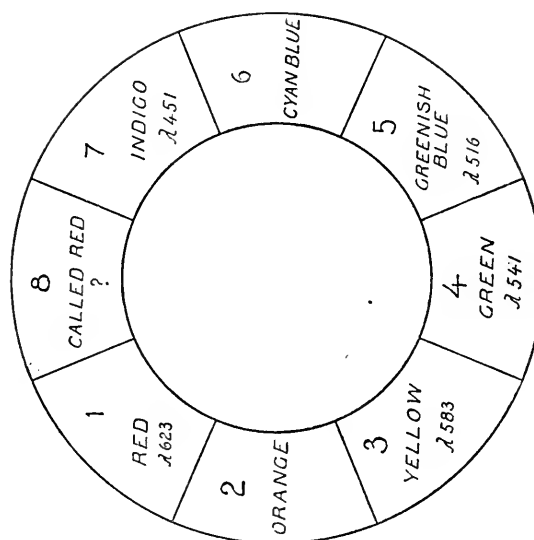


FIG. 4.

Color circle composed of the chromoscope colors as G. M. sees them, and their combinations.

are not always alike for all persons who see more than two colors.

Since the colors seen in the chromoscope are complementary in pairs, they possess the chief quality demanded in a system of four fundamental colors. They are, furthermore, evenly distributed through the spectrum. From their combinations all the colors of the spectrum can be produced; and they have the advantage over the colors of Hering's system, that they all are found in the spectrum. They are the colors 1, 3, 5, and 7 in the spectrum, and when arranged in a color circle it is found that the mixture of any two contiguous colors will produce the intervening color which separates the two in the normal spectrum, while the mixture of 1 and 7, red and violet, gives purple (Fig. 3). If a color circle is made up of the colors that G. M. sees in the chromoscope, the mixture of the contiguous colors would produce a series nearly corresponding to Hering's fundamental colors (Fig. 4); and for this reason I have suggested the possibility of Hering's visual system being related to that of G. M. G. M.'s red (1) and indigo (7), when mixed, produce to my eye a reddish purple. G. M. calls this simply red, but says it is not so yellowish as the red seen in the chromoscope.

It is easy to demonstrate that the colors seen in the chromoscope are, for the person using it, complementary. Those persons seeing two colors only, see blue and yellow or blue and reddish yellow, which, for them, must be complementary since they see no other colors.

The four colors that spontaneously present themselves in the chromoscope have all the characteristics demanded of fundamental colors, and I know of no fact or observation opposing the view that the colors seen in the chromoscope may be the fundamental colors for the person using it. Considered as fundamental colors, these differ from those of Helmholtz in being four instead of three, and from those of Hering in that they all are found in the spectrum, while Hering's red = purple. They differ from both the other series in not being absolutely fixed, but differing in different individuals, and, in cases of optic-nerve disease, differing at different times in the same individual. It is therefore

incomprehensible to me why my view has recently been described as an unsuccessful attempt to rehabilitate the Hering theory. Even if one will not accept the chromoscope colors as the fundamental colors, they are still of importance in judging of the color sense of the macula. If they are not fundamental colors, they are at least colors which are characteristic for the various color anomalies.

A word as to the relation of violet-blindness and ordinary color-blindness to normal color-perception. We have seen that both of these color anomalies may be found in persons who have previously had good color-perception, in case atrophy of the optic nerve develops. In such cases one can directly observe and follow a pressing together of the four chromoscopic colors until only one cold and one warm color remain, and finally these are lost, and no color is seen in the chromoscope.

If we assume that between those with normal color vision and those with congenital defects without pathological changes there is an intimate connection, there are two views to choose from. Either the color-blind have degenerated from a condition of normal color-vision, or the normal color-vision develops gradually through a stage in which but two colors are seen, thus reversing the process found in optic-nerve atrophy, and the color-blind are such as have remained in an imperfect stage of development. The latter view is in my opinion the correct one.

A form of pathological blue-blindness has been described by Koenig (*Sitzungsber. d. Berliner Akad. d. Wissensch.*, 1897). This is found in patients with chorio-retinitis and detachment of the retina and was spoken of in my book on the relations of the eye and its diseases to other diseases of the body and its organs (Wiesbaden, 1893).

The chief points of this paper are as follows:

1. Besides the well-known anomaly in which only two colors are seen there is another still more frequent anomaly — violet-blindness — in which the remainder of the spectrum is seen correctly, and at least three fundamental color-perceptions must exist.

2. This color anomaly accords neither with the Helmholtz nor with the Hering theory.

3. The chromoscope is a very convenient instrument for determining the color sense of the macula.

4. I myself believe that the four colors seen in the chromoscope are the fundamental colors for that particular individual. These may differ at different times in the same person if there is disease of the optic nerve.

5. According to their number and location in the spectrum I differentiate the congenital color-anomalies with normal anatomical and ophthalmoscopic conditions into: (*a*) two forms, each with two fundamental colors, the most fitting designations for which are: yellow-blue seeing and orange-blue seeing (= red-blindness and green-blindness of Helmholtz, protanopes and deuteranopes of v. Kries, and red-green blindness of Hering); (*b*) a form with as many fundamental colors as the normal-sighted possess, which is best designated as violet-blindness since this is its prominent characteristic, although there is a shortening of the long-waved end of the spectrum which, measured in wave-lengths, is almost as great as the shortening of the short-waved end (= perception of four colors with contraction of both ends of the spectrum).

6. All three of these forms of congenital color-anomaly are to be regarded as states of a less advanced development of the color preception. The latter develops in extra-uterine life in a way contrary to that in which it is lost in disease of the optic nerve. The three congenital anomalies of color are the three principal stages in the development of the color sense. Intermediate stages may at times come under observation, but these are very rare.

ON THE COLOR DISTURBANCE PRODUCED BY SANTONIN IN NORMAL AND COLOR-BLIND EYES.

BY PROF. M. KNIES, FREIBURG-IN-BADEN.

Translated by Dr. WARD A. HOLDEN.

G. M., the violet-blind patient described in the previous paper, expressed himself as being willing that experiments with santonin should be tried on him, and this led me to repeat my experiments upon myself and also to undertake some on animals. We both found that the light sense did not suffer at all from the action of santonin either in the initial stage of violet-vision, which with G. M. was blue, or in the later period of yellow-vision. Therefore it was, according to v. Kries's discovery, highly improbable that the visual purple played any rôle in santonin poisoning, since, during adaptation in the dark, vision is essentially a function of the rods. Insufficient reproduction of visual purple would have lengthened the time of adaptation and increased the threshold, but neither of these changes was found.

Herein is a very marked difference between the yellow vision of santonin poisoning and vision through a yellow glass, which in many features are similar. In the latter case the time of adaptation in the dark is markedly lengthened and the excitation threshold is greatly increased. (The same is true for the visual and color disturbances in choroiditis and in retinitis of the outer layers and also retinal detachment, the condition being called "torpor retinæ".) The difference is clearly evident; the yellow glass cuts off the violet rays which most markedly act on the visual purple,

and therefore a greater quantity of non-violet light is required to exert a noticeable action of the light. In the santonin eye, however, even in experiments in the dark, exactly as much light falls into the eye as into other eyes, and if the visual purple is normally present the light acts on it in the same way as in a normal eye.

I also examined the retinas of a dog and a number of frogs after the administration of santonin. A small dog received 1.00 of potassium santoninate, after which it was kept for three hours in the dark and then killed.

The retinas when removed showed an intense purple coloring. This was also the case with frogs after the introduction of a crystal of about 0.2 beneath the skin of the back. Santonin poisoning, therefore, is without influence upon the visual purple and the function of the rods of the retina.

On ourselves we began with a preliminary experiment. I took 0.2 and G. M. 0.15 of potas. santoninate. In my case violet-seeing came on after forty minutes, and an hour later a perceptible yellow-seeing appeared, while G. M. noticed nothing. Light sense and adaptation were quite undisturbed, as they were in the following experiment.

Some days later each of us took 0.5. After an hour I saw violet whenever I suddenly regarded white objects or pale reflexes on a dark ground. The spectrum for me was at this time considerably lengthened at both ends, at the red end from λ 742 to 764 and at the violet end from λ 404 to 398.

An hour later yellow-seeing began, and the spectrum rapidly became shortened at both ends—at the red end to λ 721 and at the violet end to λ 411. In both stages the light sense was examined and found normal.

With G. M. the colored-seeing began fifteen minutes later, and was described as blue-seeing. The spectrum at its short-waved end was increased from λ 421 to 415, but I cannot say with certainty upon what this depended. Later his spectrum became shortened to λ 707 at the red end and to λ 423 at the other, although the shortening due to the santonin was much less marked than in my eyes.

The action of santonin on the visual organ is essentially a peripheric action limited to the cones of the retina, which, after a hyperæsthesia for violet and extreme red light, later becomes anæsthetic. Analogously, I found that the entire cutaneous surface of my body, after experiencing a feeling of warmth, became numb and remained so for a considerable time.

In the stage of yellow-seeing there is hyperæsthesia for the portion of the spectrum which is still visible. The yellow-seeing is not marked in a moderately light room, but is very evident whenever white objects are looked at. The central or cortical perception of color seems to remain undisturbed, for even in the stage of yellow-seeing shadows have the complementary violet color.

It is worthy of note that in santonin poisoning not only do both ends of the spectrum suffer—a fact which has long been known—but the shortening at the red end is even more excessive than at the violet. Nevertheless the color disturbance—first excitation, then anæsthesia—is much more pronounced for violet, because of the unequal distribution of the colors in the spectrum. The same is true in congenital violet-blindness, and in optic-nerve atrophy in which the perception of violet is the first to be lost. Santonin poisoning and optic-nerve atrophy are alike in causing little disturbance of the light sense, the latter, however, being much reduced when one looks through a yellow glass.

In seeing through a yellow glass no violet light falls on the normal cones (yellow vision) and rods (diminished light sense, because little, if any, of the visual purple is decomposed). In santonin poisoning lights of every sort fall upon the altered cones and normally functioning rods (normal light sense). In affections of the outer layers of the retina, such as chorio-retinitis, detachment of the retina, and the like, lights of every sort fall upon altered cones and altered rods, the former causing the disturbances of color perception and acuteness of vision, the latter the disturbance of the light sense known as *torpor retinae*.

All this holds good for those with normal color-perception and for the pure congenital color anomalies. For myself

and for the violet-blind G. M. the symptoms of santonin poisoning are entirely analogous. I have not had the opportunity of experimenting on those who perceive only two colors. But in such persons there would be first a lengthening of both ends of the spectrum with blue-vision, followed by a longer-lasting condition of yellow-vision, with which both ends of the spectrum are shortened.

From what has been said it is easy to explain the puzzling cases of blue-vision as a minor degree of the more frequent yellow-vision in persons who are violet-blind.

TRANSFIXION OF THE IRIS.¹

BY DR. HUGO ASCHHEIM.

Translated by Dr. WARD A. HOLDEN.

AT the Heidelberg Congress of 1896, Fuchs read a paper on "Transfixion of the Iris." Now a series of cases have been operated upon and we wish to describe again the indications for the operation and results.

The operation is designed to take the place of iridectomy in cases of *iris bombe* after exclusion of the pupil, and, in the words of Fuchs, is done as follows: "An incision is made through the cornea 1-2 *mm* from its outer margin with a Graefe knife that is not narrow, the handle being so held that the blade lies parallel to the surface of the iris. The knife is then passed through the prominent iris, and a counter-puncture is made near the nasal margin of the cornea. The knife is then pushed in until the entire width of the blade occupies the counter-puncture section, when it is withdrawn."

The reports of cases which follow are arranged in two groups. In the first are cases in which the eye had been operated on previously for cataract, in the second group are the remaining cases. In Case 5, transfixion was done on both eyes. Besides these thirteen operations, five others were done on out-patients, and of these an accurate history cannot now be obtained.

I.—FIVE CASES OF TRANSFIXION OF THE IRIS IN APHAKIC EYES.

CASE 1.—L. W., aged sixty. October 31, 1891.

The patient had a senile cataract in the left eye, which was

¹ From Prof. Fuchs's clinic in Vienna.

extracted with iridectomy April 23, 1891. When discharged his vision was $\frac{5}{18}$, but later, in consequence of thickening of the capsule, it decreased to $\frac{5}{36}$.

October 6, 1891, a discission was made, and three days afterwards the tension became increased and the iris was pushed forward. October 10th, an iridectomy downward was done. At this time the patient could count fingers at 2.5 m. Since the temporal half of the iris again bulged forward and tension increased, on October 31, 1891, transfixion of the prominent portion of the iris was done, and the anterior chamber was restored at once.

November 10th the patient was discharged with a normal anterior chamber and $V = \frac{5}{36}$; in the temporal segment of the iris was a V-shaped cleft.

CASE 2.—J. S., aged fifty-one. January 27, 1896.

In January, 1894, a senile cataract was extracted from the left eye, and in December of the same year discission was done. For two weeks the patient has complained of pricking in the eye operated upon.

On examination the iris was found to be pushed forward. It was atrophic, and it exhibited a small coloboma upward, whose outer margin was not distinctly visible. The tension was increased. With $+ 12. + 2. c$, $V = \frac{5}{8}$. Transfixion was done January 28th, after which the iris returned to its place and the tension became normal. Below the pupil there could be seen a perforation in the iris 3 mm long.

CASE 3.—Schl., aged thirty-eight. March, 1896.

The patient was first seen in December, 1892, having at that time a soft cataract in the left eye. This was twice discinded in the following year, and later a puncture was made. The patient then had $V = \frac{5}{8}$ with $+ 12. D$. Six months later a delicate membrane was discinded, and in January, 1896, a thickened capsule was split. At that time $V = \frac{5}{8}$ with $+ 11. D$.

In March, 1896, the patient suddenly noticed severe pain in the operated eye while on a journey. When he returned it was found that the iris had been forced forward against the cornea, and that the pupillary margin was adherent to the capsule of the lens, the pupil being free from opaque membrane. $T + 3$.

March 4th transfixion was done, and the anterior chamber was restored. In the inner half of the iris was a perforation as large as a pin head, and three days after the operation the patient's vision

was again $\frac{5}{8}$ with + 11. D. This condition has remained to the present time.

CASE 4.—Antonie St., aged seventy-five. November 4, 1897.

On January 13, 1897, a senile cataract was extracted from the left eye without iridectomy. Some days later the iris prolapsed into the wound, and a portion was excised. A slow iritis which followed caused a blocking of the pupil and the coloboma, and necessitated an iridectomy, which was done in the horizontal meridian with a Graefe knife, leaving a black pupil which was almost circular.

But since the iris at its margin was adherent to the capsule, it became forced forward and the tension increased, so that on May 14th transfixion was done, with permanent result. Now, almost a year later, the perforations are clear, the anterior chamber is deep, and the tension is normal. With + 10. + 2. c 10° N, V = $\frac{5}{18}$.

CASE 5.—Therese H., aged forty-five. June 8, 1896.

In February, 1895, the patient was first seen with a sympathetic iritis in the right eye, and in March, 1896, an iridectomy was done downward. The new pupil closed again, and when the patient returned in June the cornea was dull, the anterior chamber shallow, the iris like blotting-paper, the coloboma closed by a membrane, the pupil, in which the cloudy lens was visible, surrounded by a grayish line where the iris was adherent to the capsule, and blocked by a membrane, T + 2, V = movements of fingers at 30 cm.

On June 9th, extraction according to Wenzel was done, but a free pupil was not obtained, the iris again pressing forward. Therefore, on June 22d, transfixion was undertaken, and the chamber again assumed a fair depth. On June 30th an iridectomy was done, and at first a fine black coloboma was obtained. Later this closed, the iris again bulged forward, tension became increased, and the eye was lost.

II.—EIGHT CASES OF TRANSFIXION OF THE IRIS IN NON-APHAKIC EYES.

CASE 6.—Marie B., aged fifty-seven. Jan. 10, 1897.

In January, 1896, an inflammation of the right eye was ushered in with redness and pain, and passed off after a month, leaving the vision cloudy. Twelve days before her first visit the patient noticed severe pain in the eye at night, and on examination there were found conjunctival and ciliary injection of the ball and

haziness of the cornea, with numerous precipitations on the posterior surface of the cornea. The anterior chamber was shallow in places owing to localized projections of the iris, which had lost its markings, and had undergone a grayish green discoloration. The pupillary margin was everywhere adherent to the anterior capsule, and the pupil, as far as one could discover through the turbid aqueous, was blocked by a membrane. T + 1. V = movements of the hand before the eye.

On January 10th transfixion was done, after which the anterior chamber was restored. A small perforation could be seen near the pupil. The tension was slightly below normal. Later two perforations could be seen in the external segment of the iris, tension was normal, and the patient was discharged, January 20th, with the ability to count fingers near the eye.

Ten days later the patient returned with a fresh attack of iritis which passed off under treatment, and on February 16th an iridectomy was done on account of the pupillary membrane. On February 18th the patient could count fingers at 1 m.

CASE 7.—Francisca Sw., aged forty-two. February 1, 1897.

About five months before, an inflammation of the right eye appeared after an injury. Since then the patient has noticed a gradual decrease in vision, accompanied by severe pain in the right half of the head and the perception of colored rings on looking at a flame. The present condition is as follows: marked conjunctival and ciliary injection, and the cornea unevenly curved, dull, and with an opacity external to its centre, corresponding to an adhesion of the pupillary margin to the cornea. The iris is discolored and without lustre, and irregularly pushed forward. T + 1.

Transfixion was done on February 3d, resulting in two perforations in the upper segment of the iris, and the bulging was permanently relieved. On February 10th there was still a slight increase in tension.

CASE 8.—Anna G., aged fifty-six. February 13, 1897.

In the autumn of 1893 the patient was under treatment for a left irido-cyclitis and received iodide of potassium and atropine which she used whenever the eye became red and painful. In the past week, the pain growing worse, the patient returned. The anterior chamber was found to be of varying depth, owing to an irregular pushing forward of the iris. The latter is discolored and dull. From the minor circle radiating yellowish stripes run toward the

periphery ; in these regions the iris is less prominent. The pupillary margin is adherent to the anterior capsule, there is a pupillary membrane, and the tension is $+ 2$.

On February 16th transfixion was made, after which the anterior chamber was restored and the tension lowered. In the upper portion of the iris two perforations could be seen, one triangular and one round.

CASE 9.—Carl H., aged thirty-three. November, 1897.

The patient had had trouble with his eyes for three weeks and was received with a slow irido-cyclitis on both sides which had led to adhesion of almost the entire pupillary margin of the iris. On November 23d an iridectomy upward was made, with good result. Three days later the anterior chamber was found to be full of blood and a brownish-green discoloration of the cornea took place from the presence of blood-coloring matter, as was first accurately described by Treacher Collins. Gradually the cornea cleared from the periphery and it was seen that the iris was being forced forward against the cornea. At the same time the tension became increased.

In this case transfixion was done on January 10, 1898, the knife being entered near the inner margin of the cornea and passed through the inner portion of the iris, but not pushed to a point of counter-puncture, because the opacity of the cornea prevented its control. Nevertheless the result was excellent, since the chamber became deep and remained so, and tension returned to the normal. The small perforation in the nasal portion of the iris remained permanently open.

CASE 10.—Albertine P., aged twenty-three. February 6, 1898.

In November of the preceding year the left eye became painful and teared. On examination the ball was found to show conjunctival and ciliary injection, the cornea and adjacent portion of the sclera were prominent, and the surface of the cornea was stippled. The anterior chamber was partly obliterated by localized protrusion of the iris. The latter was atrophic and discolored, and united by the pupillary margin to the anterior capsule. In the pupil was a fine membrane. $T + 2$. Perception of light.

Immediately after transfixion the anterior chamber was restored, and the increase in tension disappeared.

Some days later, however, while the chamber remained and the perforations were open, the iris and lens became pushed forward, and the tension again increased, so that iridectomy was done, February 10th.

CASE 11.—Franz H., aged twenty-eight. November 4, 1897.

Two years before, the patient had an alternating inflammation in the two eyes, which later passed off. Two months before, an inflammation appeared in the right eye, and a week before in the left. When examined, the right cornea was dull, the anterior chamber of normal depth, the iris dull, the pupil displaced upward, unresponsive, and blocked by a membrane; the left cornea was dull, the iris pushed forward irregularly, and the pupillary margin adherent to the capsule. R V = fingers at 30 cm; L, at 20 cm.

The day after the patient was admitted, a localized protrusion was found in the right iris, and transfixion was therefore made in both eyes. The following day the anterior chamber in each eye was deep, and one perforation could be seen in the right eye, and four in the left.

In the right eye the transfixion was of temporary benefit only, since in the next two weeks the perforation became closed as a result of a fresh iritis, the iris again bulged forward, and tension became increased. On November 17th, an iridectomy upward was done with good result; but the coloboma and pupil were later drawn toward the upper margin of the cornea by iritic exudations, and on January 18th a second optical iridectomy had to be made inward.

In the left eye the result was permanent; the four perforations remained open, the chamber remained deep, and the tension continued normal. On January 18th, the pupil having become blocked by a membrane, an iridectomy was done. When discharged, the patient's vision was R $\frac{3}{6}$, L $\frac{6}{5}$.

CASE 12.—Marie W., aged twenty-six. February, 1895.

The patient has for three years had trouble with her right eye, which now is ectatic and blind.

A week before an inflammation appeared, and now there are signs of severe irido-cyclitis. The cornea is dull, the aqueous turbid, the anterior chamber partly filled with a gelatinous exudation; the iris is hyperæmic and dull, and there is a fresh exudation in the pupil; the tension is increased, and V = fingers at 20 cm.

Later the iris bulged forward, and transfixion was done. The immediate effect was good, and the chamber was restored, but the iritis continuing, the perforations closed, and on March 16th it was necessary to do an iridectomy. Some time after, a second iridec-

tomy was necessary, and then an iridotomy, but all were without permanent result, and the eye gradually became atrophic.

The transfixion of the iris was done here in eighteen cases. In all there was a bulging forward of the iris, due to exclusion of the pupil, followed by increased tension; in some of the cases the eye was aphakic. The purpose of transfixion is to restore communication between the anterior and posterior chambers, return the iris to its normal position, and reduce tension. It matters not whether one or many perforations are made, provided any one of them remains permanently open.

Perforating wounds of the iris do not close if no iritis is set up. This observation led Fuchs to try transfixion, with the results here recorded. In three of these cases the result was not permanent, because irido-cyclitis again broke out. In certain conditions transfixion seems preferable to iridectomy. My thanks are due to Prof. Fuchs for suggesting this subject and assisting me in the preparation of the paper.

THE EXAMINATION OF TWO CASES OF OLD SPECIFIC CHORIO-RETINITIS.¹

BY DR. G. NAGEL.

Translated by Dr. WARD A. HOLDEN.

(With three figures on Plates XVIII.-XIX. of Vol. XXXVI.,
German Edition.)

THE number of microscopical examinations of eyes with syphilitic disease is not large. Besides some short reports by J. Hutchinson, Bader, Klebs, Fürstner, and Pagenstecher, I have found the following accounts in the literature. Edmunds and Brailey² make the following summary statement as to syphilis of the interior of the eye: The choroidal vessels seem not to be altered, while those of the retina, both in acquired and congenital syphilis, are thickened, probably from inflammatory processes. The central artery of the retina does not appear to become affected so long as the syphilis is not complicated with another disease. In syphilis, as in glaucoma, a varicose condition of the capillaries is often found, and in cases of chorio-retinitis the retinal vessels are often pigmented.

Nettleship,³ in a careful study of the pathological changes in syphilitic choroiditis and retinitis, comes to the general conclusion that in syphilis neither does the retinitis depend exclusively upon a choroiditis (Förster), nor does the contrary relationship exclusively hold good (Ole Bull), but rather both views are probably equally correct. As regards particular histological changes, Nettleship found accumula-

¹ From the University Eye Clinic at Breslau.

² *Royal London Ophth. Hosp. Reports*, 1882, vol. x.

³ *Ibid.*, 1887, vol. xi.

tions of cells in the choroid and between the choroid and the retina, and a thinning of the choroid after absorption of the inflammatory products, and in many cases an increase in the pigment epithelium. These changes begin constantly in the choroid and never upon it. "So far as I have seen, the choroidal changes always begin in, never upon, this tunic, the exudations upon its retinal surface occurring later from extension inward of luxuriant cell growth."

In the retina there is a general thickening of all layers, brought about by a round-celled infiltration which has not the disposition, observed in the choroid, to occur in nodules. The thickening of the nerve-fibre layer was especially well marked, and many nuclei were found in the optic nerve. In the arteries and small vessels of the retina the walls were thickened and pervaded with nuclei. In the final stage of a severe and extensive case the retina was thinned, some of its layers could not be distinguished, and the blood-vessels all were ensheathed in pigment and the lumen often closed. "Such a retinitis pigmentosa in consequence of choroiditis represents a condition which is often found in eyes blinded by chronic inflammation not of syphilitic origin."

Uthoff,¹ in a syphilitic woman of forty-seven, found extensive changes in the iris, but in the choroid only slight changes in the form of partial atrophy. The pigment epithelium was well preserved throughout. In the retina the smaller arteries and veins had their lumen more or less occluded by a proliferation of small cells.

Bach² found inflammatory changes in the adventitia and intima of the arteries and capillaries, the veins remaining unchanged. The vessels of the choroid were free from inflammatory changes, but there were patches of diffuse inflammatory processes in the supporting tissue.

From this, Bach concludes that syphilitic retinitis is independent of choroiditis.

Rochon-Duvigneaud,³ in a child of two years dead of hereditary syphilis, found in the macula of the right eye an indrawn scar in which choroid and retina were firmly united.

¹ *Graefes Archiv*, xxxix., 1, 1893.

² *Arch. f. Augenheilk.*, xxviii., 1894.

³ *Arch. d'ophth.*, xv., 1895.

About this scar was a slight detachment of the retina, beneath which was an albuminous liquid containing degenerated elements of the retina, round cells, and pigment. In the choroid there were foci of infiltration in the chorio-capillaris. The author believed that the primary lesion was in the choroid in the region of the macula where the choroidal capillary network is particularly rich and retinal vessels fail.

Dor¹ reported on both eyes of an infant which died in the course of labor. Many hemorrhages were found in the retinas, and also pigmented patches. The syphilitic nature of this case was questionable, and it is well known that retinal hemorrhages are very frequent in new-born infants that are otherwise healthy.

For the two cases which I now wish to report I am indebted to Prof. Uhthoff.

CASE R. — Clinical picture of syphilitic chorio-retinitis that had run its course. Unilateral; ophthalmoscopically similar to retinitis pigmentosa: the vessels in the periphery surrounded by pigment; no actual foci of choroidal atrophy, but numerous small foci of pigmentation in the periphery of the retina, some stellate, some circular. Death from typical paralysis. Pathological examination revealed localized adhesions between retina and choroid. Sclerosis and pigmentation of the retinal arteries, as in retinitis pigmentosa. More pronounced pathological changes in the retina than in the choroid. Vitreous practically unaffected.

The examination of a large number of microscopical preparations was made. In the anterior segment of the ball there was nothing abnormal. In the posterior segment the sclera was normal. There were post-mortem detachment of the choroid from the sclera, and of the retina from the choroid. The detachment of the retina was not general, however, and there were many adhesions between the two. At such points the pigment epithelium was mostly wanting, and it was absent also from the most posterior portions of the retina, and also from the detached portions; but since the pigment epithelium is so readily detached, its absence from the portions of the retina artificially detached is not significant.

The choroid seemed normal wherever the overlying retina was detached, but about the points of adhesion it was in high degree degenerated, the chorio-capillaris being entirely destroyed.

¹ *Arch. d'opht.*, 1896.

The retina presented more advanced changes than the choroid. At many points the outer layers were wholly obliterated. Chiefly in the inner layers, and particularly on a level with the blood-vessels, were regularly formed masses of irregularly arranged pigment. At the points of adhesion between retina and choroid one sometimes gained the impression that the pigment of the pigment epithelium had wandered directly into the retina (Fig. 1, Pl. xvii.). In some preparations the pigment that was frequently found near or in the vessel walls suggested the ophthalmoscopic bone-corporuscle arrangement seen in retinitis pigmentosa.

Further than this, there were thickening of Muller's fibres, and marked changes in the vessels. The vessels near the posterior pole appeared normal, but those elsewhere had thickened walls, often due to a diffuse inflammatory infiltration of the entire thickness of the wall, and at some points having led to complete transformation of the vessel into a connective-tissue cord. Pigment was found in the walls of many vessels in all layers, but it varied in amount and distribution. Often the vessels had a complete sheath of pigment, a condition which with the narrowing of the lumen of the vessel is that found in retinitis pigmentosa.

The pigment found in the retina has everywhere the well-known character of that from the pigment epithelium, consisting of small rod-shaped and crystalline particles.

CASE G., an idiot fifteen years of age, hereditary syphilis, both upper and both lower extremities paralyzed and contracted, patient unable to stand. Amaurosis, discs not atrophic. Picture of complete atrophy of the choroid with marked pigmentation of the entire fundus. On autopsy extensive changes were found in the cerebro-spinal system due to syphilis.

Microscopic examination: Marked alterations in the choroid with complete disappearance of the chorio-capillaris, while the retina with its vessels was unchanged. (Fig. 3.)

Sections of the posterior segment of the ball were examined microscopically. In the optic nerve and sclera nothing pathological was found, but in all the sections alterations in the pigment epithelium were manifest. At places the layer was wanting, in others greatly thickened and sending processes out into the choroid. Only a few small accumulations of pigment were found in the retina, and these only in the outer layers. The large masses of pigment in the choroid lay at points where there were infiltrations and thickening of the retina, and retina and choroid were adherent in such manner that the outer layers of the retina

had disappeared, as well as the chorio-capillaris of the choroid, while the layers of large vessels in the choroid were mostly well preserved, and the retinal vessels were normal.

CONCLUDING REMARKS.

As regards the relation of syphilitic choroiditis and retinitis, most authors agree with Förster that the retinitis is dependent upon the choroiditis. Nettleship believes that this holds good for a portion of the cases, but for other cases he believes that the retinitis is the primary affection, as Ole Bull believes. Interesting in this regard is the report of Duvigneaud, whose case of syphilitic chorio-retinitis was, without doubt, primarily one of choroiditis.

Our second case also is essentially one of choroiditis, while in our first case the retinal changes were much more extensive than the choroidal. It is thus possible that cases differ, and that the choroidal and retinal affections do not always stand in the same relation to each other.

In order to take up a further point in the pathology of this form of disease, we have spoken in detail of the changes in the vessels that were found in our cases. In general, taking into consideration these two cases, and the others already reported, it appears that the changes are inflammatory in the widest sense of the word, with a marked tendency to sclerosis.

Michel and Alexander would explain all the syphilitic affections of the interior of the eye as being due to specific endarteritis. By endarteritis specifica we understand a pathological condition in which, together with proliferation of the endothelium, a peculiar infiltration of the vessel walls takes place, the whole picture differing from the ordinary inflammatory alterations of vessels. That changes in the vessels may usher in syphilitic chorio-retinitis is unquestionable, but whether this at first has the character of specific arteritis is not yet proven. In our cases the changes were too old to throw any light upon this matter.

Finally, I should like to say a few words in regard to the similarity of old specific chorio-retinitis with retinitis pigmentosa as it appeared in our Case R., both clinically and microscopically.

Wagenmann¹ concluded on the ground of experimental investigations that in retinitis pigmentosa the choroid was the primary seat of the trouble; a conclusion which was supported by Bürstenbinder,² who had opportunity to examine microscopically a case of retinitis pigmentosa in its incipency. He found inflammatory changes in the choroid.

When we recall that Wagenmann found destruction of the chorio-capillaris with consecutive involvement of the outer layers of the retina, the similarity of these changes with those found in our Case R. is at once apparent. Wagenmann stated expressly, in opposition to Wedl and Bock³ who believed the pigment to be choroidal, that the pigment was derived from the pigment epithelium.

In our case also we saw that the pigment had, without any question, wandered into the retina from this layer, leaving gaps at various points. The pigment granules, furthermore, had the form characteristic of retinal pigment.

There exists then much anatomical similarity between old specific chorio-retinitis and retinitis pigmentosa; but, on the other hand, the specific process in our preparations is characterized by the peculiarity that the changes in the choroid and retina do not correspond in the measure in which this is the case in retinitis pigmentosa.

1. At many points there are pronounced focal changes in the choroid, above which the retina is but slightly affected.

2. At many points the retina is considerably thickened without a corresponding abnormality on the part of the choroid.

This agrees with the clinical experience that in many cases which at first seem to resemble retinitis pigmentosa, a more careful ophthalmoscopic examination reveals focal changes in the choroid, and a diagnosis of old chorio-retinitis must be made. The microscopic examination furnishes a finer test, and probably those cases of specific chorio-retinitis which exhibit no focal changes in the choroid and resemble retinitis pigmentosa would, when examined microscopically, appear very different from the typical retinitis pigmentosa.

¹ *Graefe's Archiv*, xxxvii., 1.

² *Ibid.*, xli., 4.

³ *Path. Anat. des Auges*, 1836.

Furthermore, periarteritic changes as described by Uhthoff and Bach are not found in retinitis pigmentosa, while in specific cases they furnish the proof that the vascular changes may be of manifold character, just as they are elsewhere in the body.

If one wished to be entirely accurate in the matter of nomenclature the designation retinitis pigmentosa should be applied not as at present to the simple pigmentary degeneration of the retina but rather to the chorio-retinitis, and particularly the syphilitic form that leads to pigmentation. It has long been recognized that typical pigmentary degeneration is not an inflammatory process.

The study of fresh cases of syphilitic inflammation of the eye would be of value in determining accurately the nature of the early vascular changes.

My thanks are due to Professor Uhthoff and Professor Axenfeld for their kindness in furnishing me the material and aiding me with their advice.

A CONTRIBUTION TO THE THERAPY AND PROPHYLAXIS OF EXPULSIVE HEMORRHAGE DURING CATARACT EXTRACTION.¹

BY DR. CARLO PEIRONE, TURIN.

Slightly Abridged Translation by Dr. WARD A. HOLDEN.

THE first to describe hemorrhage threatening the existence of the eye as a complication of cataract extraction seems to have been Wenzel in 1779. Beer also had seen such cases, and he writes that he always operated on them before witnesses, although he does not tell us what signs led him to expect such complications beforehand. In the present paper it is not my intention to give an historical résumé of the various cases reported, but, taking as a text two cases seen in Dr. Peschel's clinic, to consider the method by which in the future one may be able to combat or even prevent this complication either in both eyes or at least in the second eye when the first has been lost from hemorrhage.

From the cases reported, we learn that the hemorrhage may occur immediately after the scleral or corneal section (Thomas and Thompson), in the later course of the operation, immediately after the operation while the dressings are being prepared, some hours later (Warlomont, Meyer, Knapp, Simi, Badal, Gasparrini), or even a day or more after the operation (Girard, Panas, Da Gama Pinto). In cases of the last category the anterior chamber had not closed, or the wound had reopened, allowing the escape of aqueous and thus lowering the tension, or if the wound remained closed the hemorrhage was slight and recovery took place as in

¹ From Dr. Max Peschel's clinic at Frankfort-on-the-Main.

Becker's case and in Rydel's atypical case (1897), in which on the fifth day the anterior chamber became filled with blood which soon absorbed and recovery was complete. Such hemorrhages in the anterior chamber during the period of recovery after extraction may come from the iridectomy. In the first few days after the excision of the iris the new circulation does not take place through capillaries but through large anastomoses between arteries and veins, from which hemorrhage may readily occur. An immediate cause is the displacement of the iris as the anterior chamber is restored, or the dilatation of the pupil from atropine. The hemorrhage does not come from the canal of Schlemm since, as Becker has shown, this is not involved in a proper section of the cornea.

The hemorrhage may recur at regular intervals for several days (Girard), or it may recur after having begun and ceased in the course of the operation (Becker).

The hemorrhage may be accompanied or immediately followed by obstinate vomiting, epileptiform attacks (Berry), a feeling of heat in the orbit, severe pain in the eye, and flashes of light. One objective symptom is constant, namely, loss of vitreous. An intra-ocular hemorrhage may follow loss of vitreous, as it were, *ex vacuo*, but in our case the sequence was the opposite, since the hemorrhage was the active force that caused the vitreous to escape.

As to the different methods employed, Da Gama Pinto, Simi, Becker, Girard, and Warlomont observed hemorrhages after a small flap downward had been made, Sedan after a flap upward, Badal after a modified Graefe's extraction, Gasparrini after extraction with iridectomy, Hilemann after simple extraction, and Warlomont and others in spite of preliminary iridectomy, while Da Gama Pinto and Girard obtained favorable results with the last method.

Where is the location of the hemorrhage? Warlomont and Van Duyse found in an enucleated eye, besides complete loss of vitreous and detachment of the retina, detachment of the choroid from hemorrhage into the supra-choroidal space, and they therefore regard the choroid as the source of the hemorrhage. Becker saw blood pouring

through the pupil and hence concluded that it must come from the posterior chamber. In another case he observed after the expulsion of the lens a prolapse of vitreous without rupture of the hyaloid membrane and without hemorrhage, but blood could be seen in the depth of the vitreous. The eye was hard and glaucomatous and the patient suffered from severe pain and saw phosphenes. Atrophy of the ball followed without suppuration of the cornea. Proudfoot (1889) found on examining an enucleated eye that the source of the hemorrhage was a branch of the central artery of the retina which was dilated and torn at a point near the disc. Fage observed a large coagulum in the anterior segment of the ball, which separated the sclera from the ciliary body and had its origin in the choroid. Goldzieher concluded that the hemorrhage arose from the long posterior ciliary arteries, since these are the only vessels which in their intra-ocular course lie entirely behind the choroid, and since the choroid is always found intact in the enucleated eyes. Dufour also believed the hemorrhage to be supra-choroidal. Fromaget and Cabannes (1895) found the choroid and ciliary body pervaded with blood, and they believed the source to be the large vessels of the choroid, confirming their ideas by the examination of a later case (1896). Panas in one case found a great coagulum between the sclera and choroid. The fact that in the membranes forced out by the hemorrhage there are found at times bits of the retina only and not of the choroid does not disprove the view that the hemorrhage arises in the latter. In such cases the blood broke through the choroid and collected between the choroid and retina.

The examination of the vessels of the eye revealed, according to Girard and Mooren, a fatty degeneration of the walls and atheroma. Da Gama Pinto believed that the walls had been friable. Becker in one case found a telangiectasis involving the entire corresponding half of the face, and supposed that in the interior of the eye were similar varicosities which ruptured when the tension of the ball decreased during the operation. Van Duyse experimented on rabbits and found that, in spite of ligation of the jugular

vein and section of the sympathetic, no hemorrhages occurred when the vessels were normal although the blood pressure was thus greatly increased. He believed the causes of hemorrhage to be an increased tension of the vessels and arterio-sclerosis which might be primary or consecutive to the long-continued high tension. Fromaget and Cabannes found the larger vessels and the capillaries in part widely dilated but without alterations of their walls. Panas describes the retinal vessels in his case as being thickened and almost obliterated by desquamation of the intima, and the vessel walls in the choroid much thickened. Rahmer and Jacques introduced a new hypothesis. The ciliary arteries are intimately connected with the sclera where they pass through it, so that after being ruptured they cannot retract, but must remain open like the vessels of the diploë. This hypothesis is strengthened by the fact that enucleation stops the flow of blood at once since the vessel walls can then collapse.

Apart from the local conditions found in the retinal vessels, the examination of the vascular system in general will give one information as to the state of the retinal vessels. Da Gama Pinto states that in his patient simple compression of the skin on the back of the right hand was sufficient to cause ecchymoses. Hilemann found in his case that a fresh choroiditis had preceded, weakening the vessel walls, and that the patient suffered from acute rheumatism of the joints. Simi found the radial artery greatly thickened and transformed into a nodular cord, and the patient cachectic; in another case there was abdominal venous stasis. Van Duyse speaks of atheroma of the vessels or hæmophilia. He believes also that the vasomotor innervation has some influence and therefore calls these hemorrhages "essential." Terson, Panas, and others seek an analogy in atheroma, in which the general blood-pressure is increased and the heart becomes hypertrophied. Graefe observed in these patients a loss of elasticity in the skin so that folds in the skin remained for a long time.

Certain eye diseases predispose to hemorrhage. Thus, one of Da Gama Pinto's patients was highly myopic. But

glaucoma is frequently the underlying cause of hemorrhage. Spalding found iridodonesis as the result of choroiditis in his case. In Risley's patient, aged eighty-two, he found hypermature cataract, iridodonesis, and synchysis of the vitreous. In Knapp's case there was a complicated Morgagnian cataract.

The consequences of the hemorrhage were usually panophthalmitis and loss of the eye without suppuration of the cornea. Fienzal, Proudfoot, Fage, and others enucleated the eye in the course of the panophthalmitis. In many cases the eye was lost from atrophy without destruction of the cornea; such were reported by Knapp, Becker, Steinheim, Bowman, Warlomont, Graefe, etc. Girard was forced to enucleate one eye for sympathetic ophthalmia in the other. And a few observers (Becker, Girard, Gasparini) obtained a relative recovery with greatly diminished vision and contracted field. Knapp in one case had such a favorable outcome, but two weeks later fresh hemorrhages occurred in the anterior chamber and vitreous, and finally both eyes were lost from iritis and phthisis bulbi.

As to prophylaxis and therapy, Dufour advised the injection of morphine with apomorphia. The narcotic and nauseating effects cause the hemorrhage to cease, and these drugs can be used also prophylactically. One case so treated retained a slight amount of vision. Da Gama Pinto, Power, Derby, and Warlomont advise against chloroform or ether since some of their cases seem to have been brought about in this way. Jackson advised in suspicious cases that the patient be operated on in a sitting position with the feet hanging out of bed. Preparatory iridectomy is to be employed generally in glaucomatous eyes; in the non-glaucomatous it is not always a protection against hemorrhage. Spalding operated thus with good result on the second eye after the loss of the first. Da Gama Pinto saw the anterior chamber fill with blood during the preliminary iridectomy. The extraction was successfully done later but there was some hemorrhage into the vitreous.

Abadie advised continued compression of the carotid during and for twenty-four hours after the operation. The

pressure bandage is commended by some. Terson in cases of arterio-sclerosis prescribes iodide of potassium for some time before the operation and for three or four days before uses *veratrum viride* to decrease the heart's action and lower the blood pressure. Chloral is used at night. Warlomont, after losing both eyes from hemorrhage, concluded that needling only should be done in the second eye when the first had been lost from hemorrhage. Fage and others recommend ergotin injections into the temples and complete rest. Liebreich refuses operation of the second eye, preferring the relative blindness of the cataract patient to complete amaurosis.

I wish now to report two cases operated on by Dr. Max Peschel.

Madame R., aged seventy-five, came to Dr. Peschel in February, 1895, with a ripe cataract in the right eye and advanced cataract in the left. There was general atheroma of the arteries of the body and some hypertrophy of the left ventricle. Over the aorta was heard a rough systolic murmur. Traces of albumen in the urine. For some years attacks of giddiness. The eyes proved to be normal functionally, and in spite of the danger of complications an extraction was decided upon. Some days later the right eye was operated on by the modified linear extraction of von Graefe. The eye was washed out with bichloride solution 1:5000 the night before and a moist dressing was applied which was left undisturbed until the following day. After being again disinfected, cocaine and eserine were instilled and a smooth operation with iridectomy was done. There was slight hemorrhage from the iris. Scarcely had the lens been removed when the patient complained of severe pain in the eye, the margins of the section gaped, and normal vitreous protruded with a red reflex behind it. Immediately a clot of blood appeared in the wound. The eye was at once covered with a tight sublimate dressing and Dover's powder was given. As is usual in these cases the dressing was soaked with blood and had to be renewed in the evening. The inner membranes of the eye were protruding from the wound as an irregular blood-stained mass.

The treatment consisted in attempting to prevent infection by applying a moist bichloride dressing. This was changed twice a day and was always stained with blood. On the third day the

prolapsed mass was cut off close to the ball with scissors. The two lips of the wound remained separated by a solid, bloody, pigmented mass. The dressing still showed traces of blood a month later. Since the eye was kept antiseptic, purulent panophthalmitis was prevented, but the ball atrophied until, two months later, only a stump was left with a deep retraction corresponding to the corneal section.

The prolapsed matter that was excised was examined partly fresh, partly after being hardened in Müller's fluid. It consisted of a portion of the ciliary body and iris with the adjacent choroid and retina. One could distinguish a portion of the periphery of the retina about 3 *mm* long. In sections the retina was seen to be separated from the choroid by a blood clot. In the choroid and in the ciliary body were parenchymatous hemorrhages partly diffuse, partly localized, forcing the normal elements apart. The retina contained blood, its elements were altered, and there were many small vacuoles indicating œdema. All the tissues showed an infiltration with leucocytes, densest near the vessels. The choroidal arteries were atheromatous, their walls thickened, the intima and media in a state of granular fatty degeneration or calcification, the adventitia sclerosed, the lumen often narrowed. Single venous trunk also showed calcareous degeneration. The capillaries were dilated and overfilled with blood. All these alterations were less marked in the vessels of the retina. A small arterial branch in the choroid was found to be obliterated.

In this case the hemorrhage was due to rupture of the atheromatous vessels, aided by the compensatory hypertrophy of the heart, the determining cause being the sudden lowering of tension at the operation. The length of the corneal section is of importance, for prolapse of vitreous and rupture of the hyaloid membrane occur much less readily when the section is small.

When the cataract in this patient's other eye was ripe, a different method of operation was selected. With a discission needle an N-shaped incision was made deep in the lens. After seven days a small lance was passed obliquely through the cornea, so that the wound would gap as little as possible, and the masses of swollen lens substance were removed by pressure and with the spoon. The zonula and posterior capsule remained intact. On the evening of the same day

the anterior chamber was restored. There was no iritis. After a month the atropine was discontinued, and after two months vision, with the correcting glass, was $\frac{1}{2}0$.

A second, analogous case was that of a cook, aged seventy-two, who came to the clinic the 1st of March, 1896, with a ripe cataract in each eye. There was general emaciation and atheroma of the arteries, with marked hypertrophy of the left ventricle. The patient suffered habitually with dyspnœa, palpitation, dizziness, and pain about the heart. The condition of the eyes was absolutely normal, except for the cataracts.

On March 10th an operation with iridectomy was attempted on the left eye. When the capsule was divided, the patient noticed a severe pain in the eye, with phosphenes. Then the lens escaped and a bead of vitreous prolapsed. In the vitreous could be seen a bloody tumor, covered with the inner membranes of the eye. These were cut through with de Wecker's scissors, allowing the blood to escape and the membranes to collapse.

The hemorrhage continued for six days, and later iritis led to an exudation blocking the pupil. Two months after the operation the tension was normal, perception of light existed, and projection was wanting only from the upper-inner portion of the retina which had been detached.

A month after this operation the problem arose as to the operation on the other eye. The capsule of the lens was divided by N-shaped incisions. An iritis developed, with a slight increase in tension. A small vertical section of the cornea was made with a lance obliquely and the liquid portion of the lens evacuated. The following day the eye was quiet and the pupil dilated well with scopolamine. Five days later the section was opened with a spatula and the bulk of the lens was evacuated. A few cortical masses were left, the eye remained somewhat sensitive, and for two weeks a small hyphæma persisted. Two months after the operation, with the correcting glass vision was $\frac{1}{4}0$. The vitreous was clear, and the fundus was normal, except for patches of senile choroiditis about the disc.

The method of operation described led thus in two cases to very satisfactory results, and I would recommend it for the first eye when hemorrhage is feared, and for the second

eye when the first has been lost from hemorrhage. Discussion of a ripe cataract is much less to be feared than discussion of an immature cataract. The method of operation is exactly that used for the removal of the transparent lens in high myopia.

These two case histories show that expulsive hemorrhage is not always due to glaucoma. And it is in these cases only that the operation is indicated. In glaucoma, it goes without saying that a preliminary iridectomy should be done. In support of our view we may cite those cases in which, even after preliminary iridectomy, the eye was lost from hemorrhage (Gasparrini, Warlomont, Van Duyse), a palpable proof that the operator should seek for a safer method.

The bibliography of the subject may be found in Spalding's paper, these ARCHIVES, xxv., 1, p. 92 (1896), there being wanting only references to the paper by Terson (1894) and Willot (1891).

REPORT OF THE TRANSACTIONS OF THE SECTION
OF OPHTHALMOLOGY AND OTOTOLOGY AT THE
NEW YORK ACADEMY OF MEDICINE, MAY 21,
1900.

BY DR. J. H. CLAIBORNE, SECV.

The evening was devoted to presentation of specimens and cases, and discussion upon the **cause, prevention, and treatment of prolapse of the iris following simple extraction of cataract.**

Dr. ARNOLD KNAPP described a **method of preserving macroscopic specimens of eyes** based on Kaiserling's procedure (*Virchow's Archiv*, 1897, vol. cxlvii., p. 389) of preserving the natural colors of pathological specimens. The method is the following :

1. The usual fixation and hardening in 4 % formol for 4-5 days.
2. Bisection of eyeball.
3. The eye is placed in a solution of 80 % alcohol for 6-12 hours until the color of the blood is restored, and then in the following mixture :

- | | |
|-----------------------|-------|
| 4. Acetate of potash, | 200. |
| Glycerine, | 400. |
| Water, | 2000. |

in which the eye may remain an indefinite time, until ready to be preserved in the same mixture in a Priestley Smith jar. By this method the natural color of the eye, the color of the blood, the transparency of the cornea, and to some extent of the lens, are permanently preserved. The formol preservation of eyes has many advantages over the old jelly method, but the detrimental action of formol on the color of the ocular structures is well known.

Two specimens, one of a **gumma of the ciliary body**, the other of **multiple cysts in a detached retina**, preserved after this method, were then exhibited.

Dr. M. L. FOSTER exhibited a boy of six, in which there was **exophthalmos and paralysis of the external rectus**. Kroenlein's operation was done. Around the optic nerve was found a pear-shaped tumor whose apex pointed toward the ball. This was evidently cystic in character, and had a bluish, thin wall. The tumor was aspirated and cerebro-spinal fluid was withdrawn. The sac could not be completely removed, but portions of it were taken off. The optic nerve was clearly demonstrated. The subsequent result was good, although internal strabismus existed after the operation. At the time of presentation there was optic atrophy. In the beginning, however, there was no optic neuritis. The exophthalmos disappeared. Dr. Pooley noticed that there was anæsthesia of the cornea, which he attributed to injury to the ciliary nerves.

Dr. SKEEL presented a case of **corneal injury** due to a broken china cup. There was prolapse of the iris, which was excised. A flap from the conjunctiva below was drawn up to the top of the cornea, covering the wound. On the second day the anterior chamber was restored. On the fifth day the conjunctiva was œdematous, and subsequently the flap became adherent to the cornea. It then contracted somewhat, and the patient at time of presentation had vision of $\frac{3}{8}$. Dr. Skeel proposed to remove later the conjunctival flap covering the cornea.

Dr. CHAMBERS presented a case in which there was **absence of the auditory canal on either side**, with rudimentary or imperfectly formed auricles. As to family history, the father's brother had a deaf-and-dumb child.

Dr. W. A. HOLDEN presented a **glass composed of red, green, and blue**, which was constructed for the purpose of viewing the eclipse of the sun which was shortly to occur. Dr. Holden stated that this combination of colors diminished the luminosity of the sun, but permitted the normal color to remain. Dr. Skeel remarked that it might be a good thing in the belt of total eclipse, but at this position, New York, the corona could not be seen. Dr. Holden replied that he had constructed it for some friends who were going to Norfolk to view the eclipse.

Dr. EMIL GRUENING opened the discussion on the **cause, prevention, and treatment of prolapse of the iris** in these cases, and said that the cause of the prolapse of the iris was undoubtedly pressure on the eyeball during the operation, pressure of the bandage after the operation, increased intravascular pressure, and,

altogether, all conditions which tend to increase the intraocular pressure. In order to prevent prolapse of the iris, it was the custom of some to discard the speculum during the operation. Others resorted to hypodermatic injections of morphine, in order to quiet the general nervous system of the patient. Some thought that the section of the cornea, if perpendicular to the surface, predisposes to prolapse. He said that the elasticity of the iris played an important rôle, and was also to be considered. There was no doubt that some irides are more elastic than others, and have a tendency to return to their first position when the cause of the extrusion is removed. In order to obviate the conditions favoring protrusion of the iris, a number of devices have been adopted, which might be divided into the following classes :

1st. Reduction of intraocular tension, for example, by cocaine, pilocarpine, eserine.

2d. Strengthening of the weak point—that is, the point of least resistance. To this end, he referred to Kalt's suture, the conjunctival bridge, and von Milligen's contact glasses.

3d. Diminution of the area of impact by incising the iris after the manner of Schweigger, or buttonholing the iris, after the manner of Chandler (Boston, Mass., *Char. Eye and Ear Inf.*), Flueger, or Bel-Taylor.

4th. Lowering the general intravascular pressure and, secondarily, intraocular pressure. In his own experience, he had found that the lowering of the intravascular pressure during and before the operation by the instillation of a 4% solution of cocaine, and after the operation by the instillation of a 10% solution of cocaine, had acted most happily, by inducing an hypotony of the globe, and subsequently a retention of the iris. The use of cocaine, he maintained, in the way he had mentioned, does not cause opacity of the cornea, nor dilatation of the pupil subsequent to the operation, as has been stated.

The treatment of prolapse of the iris, he said, might be discussed under the following heads :

1st. Conservative treatment.

2d. Treatment by cauterization (actual cautery).

3d. Reduction of the iris.

4th. Abscision of the iris.

5th. Excision of the iris.

Of all these methods, it was the fifth, excision of the iris, which he was accustomed to practise, not only in prolapses which oc-

curred within twenty-four hours after the operation, but also in those that occurred at a later period. By excision he wished to be understood a cutting out of the iris from between the angles of the wound, so that after the completion of the operation there would remain a clean iridectomy in the shape of a key-hole pupil. It has been asserted by some that the frequency with which there is prolapse of iris following the lower section of the cornea is due to the fact that the iris falls by virtue of its own weight, namely, by gravity. On one occasion, when Schweigger was operating for cataract, and was making an inferior or lower section, a bystander made this remark. Schweigger replied that, in his opinion, the iris did not prolapse by virtue of its own weight, but on account of the influences from the rear, or from other causes. This notion had impressed Dr. Gruening, and he used this as an introduction to his remarks.

The discussion was continued by Dr. C. S. BULL, who said that Dr. Gruening had covered the ground so well that he could only speak of the methods of preventing the prolapse of iris, and the treatment of it when it occurred. He said there was no one rule for all cases. It was necessary for the surgeon to study each case, and so get at the prophylaxis for each one. He thought it proper to always study the action of the iris. He was accustomed to do this repeatedly under the use of a 5 % solution of cocaine, and in this manner decided whether a simple extraction or combined extraction should be employed. If the iris was rigid under the use of cocaine, he thought it likely to be rigid after the operation, and so was likely to be prolapsed. Under these circumstances, he was not accustomed to do a simple extraction. If the patient was an unruly person or easily excited, he was accustomed to do an iridectomy, and if there was plus tension after the use of cocaine he also did an iridectomy. It was his habit to use cocaine after the manner stated by Dr. Gruening. He examined the eyes twenty-four hours after operation. If he found a prolapse, partial or complete, he would first try and replace it by a spatula. If not possible to do that, he would excise it. If a prolapse occurred after twenty-four hours, he preferred to leave it unmolested. He thought this rule was a good one, because prolapsed irides often flattened. To sum up his treatment, he said if prolapse occurred after twenty-four hours he excised. If after three days, he left it alone.

Dr. KNAPP said he divided the causes of prolapse of iris into five classes :

1st. Any rupture of the suspensory ligament before or during the operation.

2d. Prolapse of vitreous, either immediately after or subsequent to the operation.

3d. If the corneal section fell beyond the limbus.

4th. Injury during the first days after the operation.

5th. Restlessness of any kind during and after the operation.

The prevention he also divided into five classes :

1st. Iridectomy before or after the expulsion of the lens in defective zonulæ.

2d. The greatest caution was necessary in opening the capsule, lest the zonula be ruptured, especially in hypermature cataracts, in which dislocation of the lens and capsule, or rotation of the lens inside the capsule may occur.

3d. Insufficiency of corneal section or of capsular opening. The capsular opening, especially in hypermature cataract, should be sufficiently peripheric, otherwise the edge adjacent to the section will be kept in a pouch at the periphery, and there will be a breech delivery by turning of the lens, which is laborious but not bad.

4th. Watching of the patient during the first days and nights by an extra nurse in restless patients.

5th. Masks of different kinds.

As to treatment, he was careful during the operation to cleanse the pupillary area of remnants, reduce the iris (if it did not resume its position by its own elasticity) by gentle rubbing, or with a blunt-pointed probe. If he could not obtain a central, round pupil, he made a small iridectomy and reduced the columns of the coloboma carefully.

He inspected the eye a day after the operation. If there was prolapse, never so small, he seized it with forceps, abscised it, and reduced the limbs of the coloboma. He had tried reduction of small prolapses, but as they mostly reappeared, he had given up reducing them. When the prolapses had occurred longer than one, or, at the highest, two days before they were noticed, he did not interfere until the wound had completely healed, when he abscised them like any other partial staphyloma.

Dr. T. R. POOLEY agreed with Dr. Gruening in the opinion that a rigid or non-resilient iris is especially apt to be the cause of prolapse. He thought the discriminations made by Dr. Bull, in a careful examination of the behavior of the iris under cocaine, of value, as were also those of Dr. Knapp, in reference to the

character of the cataract. He would add to the category which Dr. Knapp had given, such cases of cataract as were not yet completely mature, as unfavorable for simple extraction because of the liability of producing prolapse of the iris in the attempts made to extrude the soft lens remnants. He could not see that the instillation of a ten per cent. solution of cocaine would prevent prolapse, but, on the contrary, would rather favor it.

In order to prevent prolapse of the iris, not only was it important not to make the wound too small, but also not to place it near the periphery but well within the sclero-corneal margin. The most frequent cause of prolapse after extraction he thought to be due to disquietude on the part of the patient during the first night after operation, by preventing closure of the wound, and in many other cases even trauma inflicted by the patient's hands.

In regard to treatment, he expressed surprise that so little had been said about the treatment of prolapse during operation, and said that the efforts to replace the iris which made necessary the frequent introduction of instruments in the wound and into the anterior chamber, were to be deprecated ; unless the iris replaced itself or was readily replaced, iridectomy should be done. In case of the appearance of prolapse after extraction, he would excise the iris where it occurred after the first twenty-four hours, but in cases occurring later, leave it to nature. One case was cited of prolapse after the third day which healed without a cystoid scar and the visual result was very good.

In conclusion, reference was made to the danger and difficulty of excising the iris in unruly patients through the loss of vitreous, hemorrhage, etc. He gave the history of one case in which the loss of vitreous made an imperfect iridectomy and the result was a bad one. He also mentioned a case of a colleague's in which, through the unmanageability of the patient, vitreous was lost, irido-dialysis caused, and hemorrhage took place, the eye being lost. The use of an anæsthetic was therefore urged as the safest and wisest procedure when attempting to excise the iris in cases in which prolapse took place after operation.

Dr. RICHARD DERBY said that he hardly felt he had a place in this discussion, and he was afraid his remarks would be considered far afield. It was his custom always to perform the combined operation, that is, the operation with iridectomy, and therefore he did not feel that he could properly discuss the "cause, prevention, and treatment of prolapse of the iris following simple extrac-

tion." It was in order to prevent the accidents and contingencies that had been so clearly outlined by the gentlemen who had already spoken, that he had adopted the combined extraction, and while he felt that he did not follow the mode of the day, he nevertheless was in the line of safety.

Dr. J. S. PROUT said he believed that the use of the bandage after extraction does injury by interfering with the coaptation of the lips of the corneal wound, and is, therefore, a factor in the cause of prolapse of the iris after simple extraction. To avoid this unequal pressure Michel advocated closing the lips of the wound by a light plaster and no other dressing, not being afraid to leave the eyes so little protected. He referred to the suggestion of Dr. H. W. Skerry, of Brooklyn, who was accustomed to use a wire mask in addition to the plaster dressing. This mask is figured and described in the *American Journal of Ophthalmology*, January, 1891. He found, however, that the plaster interfered with the application of liquids to the eye, and so on March 11, 1890, in the case of a man of eighty, with chronic conjunctivitis, instead of using the plaster he inserted a silk suture through the edges of the lids after the cataract extraction. In this way he was able to instill a weak solution of bichloride of mercury between the lids. He found this method very good. The suture was removed in four days. A single aseptic silk suture will do the work. He thought it well to insert the suture before the operation, as there might be some injury done from sudden resistance or starting on the part of the patient after the operation. In *La Clinique Ophthalmologique*, April 10, 1900, Dr. Jocs reports having used fine silver wire for this purpose with good result.

Dr. DAVID WEBSTER divided the causes of prolapse into two classes, non-traumatic and traumatic. The first class he also described as the mechanical method. He said that regenerated aqueous humor filled the space formerly occupied by the lens and also the anterior chamber. The tension then becomes increased. The aqueous runs out and the iris falls out with the aqueous. Patients are then accustomed to feel pain and the sensation of a gush of water. When this history is told him, he is accustomed to take off the bandage, and he usually finds prolapse of the iris. 2d, traumatic causes are due to the rubbing of the eye by the patient, or some other form of injury. He saw no way of preventing traumatic prolapse of the iris except by using a mask. Immediately after the operation he was accustomed to use both a

bandage and a mask over the bandage. When the anterior chamber had filled completely, he used simply a wad of cotton and a mask over it. Under any circumstances, he was accustomed to find about 4 % of prolapses of the iris. He had replaced the iris with a spatula, and had seen good success, but he had abandoned it. On several occasions he had destroyed the prolapse with the actual cautery, but he was not satisfied with that method, as severe iritis had followed. To excise or not to excise, is the question. If much inflammation attended prolapse, he thought it unwise to excise. He waits until the inflammation disappears, and then, if the prolapse is not flattened, he cuts it off, but he cuts off only that part which is outside. Twenty-four hours after the operation he is accustomed to do an iridectomy.

Dr. SUTPHEN said he was accustomed to follow the habit of Dr. Bull, viz., observing the pupil in a good light. In consequence of this method, he had come not to fear prolapse as much as he had before. He allows the patient to sit up on the day following the operation, and used a cloth shield over the cotton dressing.

Dr. CALLAN said he thought prolapses were mostly due to traumatism, and that cases in which there was a deep anterior chamber were less likely to prolapse than those in which there was a shallow anterior chamber. He thought that Dr. Webster was right: The cause of the prolapse lay in the leaking and outflow of the aqueous humor. The position of the head was also a matter of importance. In shallow eyes he considered there was more chance of prolapse, because the resistance to the outflow of the aqueous humor was greater. He also considered that violence to the sphincter of the iris was a cause; likewise when the cataract was large. More force would have to be employed to deliver it, and in such cases the iris was likely to be prolapsed. If, after the extraction, the pupil remained oval, it was likely that there would be a prolapse. He always tried to replace the iris, whether 24, 36, or 48 hours after the operation,—it made little difference. He thought the suggestion of Dr. Pooley, that anæsthesia should be employed when a second operation was necessary, was a good one. In unruly patients he used cotton and a mask.

REPORT ON THE SECTION OF OPHTHALMOLOGY, BRITISH MEDICAL ASSOCIATION.

By C. DEVEREUX MARSHALL, F.R.C.S.

IPSWICH MEETING, AUGUST 1 AND 2, 1900.

DR. W. A. BRAILEY, PRESIDENT, IN THE CHAIR.

Presidential Address.

Dr. W. A. BRAILEY, ophthalmic surgeon to Guy's Hospital, took as the subject of his address Ocular Headaches—that is, headaches in association with refractive and muscular errors. While the great majority of headaches were, he said, independent of the eyes, it was a matter of general acceptance that ocular errors produced headaches, though by no means in all cases. Were there any errors especially effective in the causation of headaches or in producing any particular form of headache? Muscular errors were by far the most important, though, of course, these must be ultimately of nervous origin. Ocular movements were intrinsic (pupillary and accommodative) and extrinsic (of the recti and obliqui muscles). The pupillary movements were unimportant except as slightly influencing glare. The accommodative movements were bound up with the great majority of ocular headaches.

It was a general law that the larger the ocular error the less the effect produced on the head, the reason being that a great defect of accommodative power led to its abandonment, the patient seeing as best he could without it. So, also, uncorrected presbyopia was rare as a cause of headache, except just at its commencement. It might cause strain and burning but not headache. A highly hypermetropic patient would read close with poor vision but no aching. So also patients with high hypermetropic astigmatism. Similarly, great inequality of refraction gave comparatively

little trouble, the worse eye being abandoned to disuse and muscular action being regulated by the better one. High degrees of myopia and myopic astigmatism produce little effect, distant objects hardly being seen, while near vision could be remedied largely by adjusting the distance. But low degrees of hypermetropia and hypermetropic astigmatism were often causes, especially when they led to an excess of effort both in amount and duration beyond that which was needed, as with weak muscles or hypersensitive nervous supply, this spasm of accommodation continuing in distant vision, and even under retinoscopy in the dark. But both spasm and headache were more produced by moderate inequality of refraction, especially if astigmatic and most of all by astigmatism with asymmetry of the axes. The ciliary muscle appeared to act unequally on the two sides in correcting this or a muscle even in different parts of its circuit in remedying astigmatism or asymmetry of axes. Evidence of this was seen when atropine revealed astigmatism on one side or both, increased its amount, or altered the axis of the correcting lens in amount less than 90° . So astigmatism, often unequal-sided, might become manifest when presbyopia began, and refractive defects revealed themselves to retinoscopic examination in eyes blind with fundus changes, such as optic atrophy, in proportion beyond that observed in average-seeing eyes. The above refractive errors caused aching in the eyes, often passing presently or on the following morning into the brows, immediate aching in the brows, temples, the back of the head, and occasionally also headache of the type of migraine. Treatment by appropriate glasses was of extreme value. Errors of the extrinsic muscles produced headache, but less than of the accommodative muscles, though more migraine, more giddiness, and more general distress. Here, also, the rule held that the larger the amount of error the less the disturbance, the explanation being that in considerable degrees of strabismus the image fell on the peripheral and so less acutely seeing retina.

But another potent factor in headaches was the tendency to binocular vision, and so we had another rule—the stronger the tendency to binocular vision the more headache produced by an error of the recti and obliqui muscles. Binocular vision varied much in its strength in different subjects. Possibly there were natural differences related to the centres as much as to the muscles, for he had seen such indisposition run through families.

But binocular vision appeared to be generally made rather than born. Babies often squinted irregularly till after a few weeks of life they got their yellow spots gradually to accord. He had met cases where, instead of bringing them into harmony, the child had developed another retinal point to work with the opposite yellow spot in an eye congenitally squinting, though with fair concomitant movement. Rectification of such apparent squint by tenotomy would produce diplopia. Other cases were common where the two eyes remained quite independent; for example, where there was congenital want of power of both external recti from central defect, diplopia was absent and the child saw to his left with the right eye, and *vice versa*. Binocular vision was not strongly established by the early age at which ordinary concomitant squint arose; so diplopia, though present, gave no trouble, and, indeed, was little noticed even in the comparatively rare cases where each eye had normal refraction and vision. But to take the case of a paralytic strabismus—for example, of the superior oblique—suddenly arising in an adult: here was much disturbance, and the same with cases where, when the two eyes had been used for different purposes—that is, one for near and the other for far,—they suddenly attempted by lenses and prisms to unite the images, the results being distress, giddiness, migraine, and other headache. But extrinsic muscles might, like the ciliary, have large latent defects, and he suspected that many obscure cases of headache had their solutions here.

Besides individual tendencies other influences altered the disturbing effect of ocular errors: (1) age, the errors being most potent between the ages of ten and forty-five years; (2) sex, women being the greater sufferers; and (3) nationality. His experience did not extend much beyond the English people and the citizens of the United States, the latter of whom were eminently affected by these errors, so that a series of medical men and operators had arisen to take charge of that special sub-section of practice. Doubtless there were other influences, such as occupation and temporary states of the nervous system.—*Brit. Med. Jour.*

Discussion on the treatment of **chronic glaucoma**.

This discussion was opened by Mr. RICHARDSON CROSS, who based his opinion on the results obtained in forty-seven cases of the disease, which had come under his care in private practice. He had frequently found difficulty in distinguishing some from cases of optic atrophy, and the perimeter was of special value in

these cases, the contraction on the nasal side being very characteristic. There was no doubt as to the fact that progressive glaucoma would cause blindness sooner or later through atrophy if left to itself, and in the majority of cases drugs were incapable of saving the sight alone.

He looked upon iridectomy as the most useful operation, and in a simple chronic case it was comparatively easy to do, and very much easier than in acute cases. In some exceptional cases, in which the presence of the disease was doubtful, it could sometimes be cured by drugs alone, and he mentioned a case which, after treatment in this manner, showed no increase of tension after prolonged dilatation with cocaine. The treatment of chronic glaucoma by drugs alone in nearly all cases, however, led only to the gradual deterioration of vision.

He then showed numerous charts of fields of vision which had been taken both before and after operation, and treatment with myotics, and in many of the cases the fields of vision had improved after the disease had been arrested. In very early cases he thought that sclerotomy done with a keratome, as recommended by Snellen, was very useful, and he preferred a keratome to a Graefe knife, as he thought that a more peripheral wound could be made. He was strongly in favor of early operation, and he did not think that anything but harm could come in the majority of cases if drugs without operation were relied on.

Mr. JOHN HERN thought that the one thing needful was an early diagnosis, and the sooner an iridectomy was done the better the chance of a good result. He thought that there was a close relation between optic atrophy and glaucoma. His practice was to do an iridectomy as soon as possible, and to follow this up by establishing a communication between the anterior chamber and the vitreous by passing backwards through the coloboma above the lens a narrow double-edged knife, and then to slightly rotate this in order to make the opening a little larger.

Mr. WORK DODD was by no means inclined to look so favorably upon iridectomy as a cure as Mr. Cross appeared to do, and this led him to remove the superior cervical ganglion of the sympathetic. He described minutely his case, which immediately responded by the pupil becoming contracted, and the tension diminished. He thought that in a suitable case this operation was justifiable.

Dr. CARL GROSSMANN said that he preferred pilocarpine to

eserine. Massage had given good results, especially in the form of a mallet driven by a galvano-motor. One mode of treatment which was especially useful when a patient was averse to the more serious operation of iridectomy was the subconjunctival injection of sterilized salt solution, which had given very encouraging results in his hands.

Mr. BOWER fully agreed that the sooner an operation was done the better, but thought that occasionally a case might be kept in a practically stationary state by the use of myotics, and he mentioned a case he had had under observation which had not got materially worse during six years. In very early cases with good vision he thought that the operation of sclerotomy, as suggested by Mr. Cross, might be very valuable, as the immediate result on vision would not be so marked as if a piece of the iris were to be removed.

Mr. G. A. BERRY had seen many early cases kept in check for years with pilocarpine, but he was strongly of opinion that in cases which had entered the confirmed stage the sooner iridectomy was done the better. He had seen cases in which, ten or fifteen years after the operation, the vision had undergone no deterioration. He thought that the worse prognosis was in those in which there existed a central or paracentral scotoma. He preferred iridectomy to sclerotomy, and did both with a keratome. The best results were obtained in those cases which healed with a flat scar. Scleral puncture he had tried, as recommended by Priestley Smith, as a preliminary to iridectomy. He had never excised the superior cervical ganglion of the sympathetic.

Mr. DEVEREUX MARSHALL thought that considerable damage might be done by the operation recommended by Mr. Hern, both to the lens and also to the ciliary body.

The PRESIDENT thought there was no reason to believe that the disease would progress, unless the tension were relieved. He thought that there were many fallacies in the perimeter. While coarse tests with a rapidly moving object, whether the finger or a 10 mm square, show a good field, yet fine tests show very great contraction of the field, and this would explain easily the considerable enlargement of the field that may undoubtedly occur under myotics. With regard to prognosis, although he did not consider it good, yet in cases on which he had operated early he had never had a bad result. When, however, the fields failed and the disc atrophied, he thought that, as a rule, the disease progressed in spite of all treatment.

Mr. SYDNEY STEPHENSON read a paper on the **etiology of phlyctenular eye affections** and, according to his experience, 20 to 25 per cent. of the eye patients at a children's hospital suffer from this disease.

There is, nevertheless, no general agreement as to the etiology of the cases. Mr. Stephenson had collected 669 cases, met with in hospital practice, and analyzed them, with special reference to three main points: (1) the frequency of an associated eczematous inflammation of the skin; (2) the existence of a tuberculous diathesis; (3) the influence of zymotic ailments in exciting phlyctenular disorders.

He found that of the total number of cases eczema was present, or had been present, or was known to have appeared later, in no less than 53.06 per cent. He was therefore inclined to regard phlyctenulæ as an ocular manifestation of eczematous inflammation.

The author also pointed out that eczema affected also the mucous membrane of the nose, lip, tongue, and palate. The oral lesions had hitherto escaped description. They commenced as vesicles, and speedily formed small circular or oval ulcers, which soon healed.

Mr. Stephenson found tuberculous tendency, or tubercle, in 31.98 per cent. of his 669 cases. He looked upon a marked tendency to phlyctenular disease as an indication that the patient was likely to become tuberculous — that is to say, if he did not already suffer from tubercle. In 13.45 per cent. of his cases measles, whooping-cough, chicken-pox, or scarlet-fever was assigned as the cause of the eye mischief. Mr. Stephenson regarded phlyctenular disease as due remotely to the tuberculous diathesis, and immediately to an eruption of eczema on the surface of the eyeball. The exciting cause might be of a general nature, as bad hygienic surroundings or measles, or of a local character, as slight injuries to the eyeball.

Mr. KENNETH SCOTT described a case of **dacryo-cystitis aggravans** which occurred in a woman, a native of Upper Egypt, who came to him with double dacryo-cystitis, which on the left side had attained an enormous size and resembled a malignant tumor of the face. He opened it and evacuated a large quantity of pus and mucus. The patient did well, and in five weeks she had quite recovered.

- Mr. W. WATSON GRIFFIN related a case of **leuco-sarcoma** of

the iris which occurred in a young lady aged nineteen. In the left eye there was a growth, visible in part to the naked eye through the pupil, which pushed the iris forwards at the lower and outer side. The lens was displaced inwards and partially opaque.

Mr. Griffin diagnosed a malignant growth and excised the eye. On examination it proved to be a leuco-sarcoma with very marked hyaline changes. He thought that in a case treated so early the prognosis should be good. The points of chief interest were the youth of the patient, the extensive hyaline changes, and the dense white appearance.

The discussion on **lachrymal obstruction** was opened by Mr. G. A. BERRY, who referred to the great divergence of opinion held by surgeons as to the best method of treating this affection.

He was inclined to think that there was a great tendency to overtreat these cases, and this was due to the common belief that the cause of the trouble was in nearly all cases due to obstruction in the nasal duct, whereas in reality it was catarrh of the sac and duct. He condemned the use of large probes, as these frequently caused a stricture at the opening of the canaliculus into the sac, and this was especially likely to occur when the lower canaliculus had been slit. He preferred in nearly all cases to slit the upper one, as the direction of the channel thus made lay more in a line with the duct and there was consequently less stretching at the mouth of the sac and less laceration of the surrounding parts when the probe was passed. Owing to the fact that removal of the sac generally produces but little epiphora, it was obvious that faulty excretion was not the chief cause of the trouble, but probably hypersecretion of tears, due to an irritation which originated in the sac and possibly in the duct also.

In *early cases* Mr. Berry advocated slitting the upper canaliculus and then probing at intervals of a fortnight or longer, when usually three or four probings were sufficient. As a rule, syringing was unnecessary except in those cases in which the sac was overdistended, and then this, followed by pressure over the sac, was very useful.

Should an abscess develop, this was best treated by opening the sac by slitting one or both canaliculi, or, if necessary, opening it on the face.

In conclusion, Mr. Berry advised early interference in catarrhal conditions of the sac, viz., by slitting the upper canalicu-

lus into the sac and then probing at shorter intervals with a medium-sized probe. In dacryo-cystitis, free incision with good drainage was usually indicated ; this must be followed by opening of the canaliculi and in some cases by probing at fairly long intervals. In chronic cases, or those frequently recurring, complete removal of the sac was probably the best treatment. Large probes, frequent probings, and the use of styles were in his opinion to be avoided, while removal of the lachrymal gland or any portion of it was altogether uncalled for.

Dr. CARTWRIGHT said he avoided as far as possible the slitting of canaliculi, as it caused needless damage and impaired their function. In advanced cases, some could be cured by small probes, while for others gold styles were necessary. He thought that syringing was useful, but he had never seen any advantage arise from the use of hollow styles, nor had he ever seen a case in which it was necessary to remove the lachrymal gland.

Mr. KENNETH SCOTT, in cases of chronic inflammatory thickening, preferred the use of rather large probes and the syringe. He thought that lead styles were the best, and he had never seen harm arise from slitting the canaliculus.

Dr. ST. CLAIR THOMSON approached the subject from the standpoint of a rhinologist. In the cases he had examined he had not found any disease of the nose to account for the trouble, though he thought the primary infection of the duct and sac might come from the nose. He showed a drawing of a section of the nasal cavity to illustrate the large diameter of the lower end of the duct and also the large space between the inferior turbinate bone and the outer wall of the nose.

Mr. BOWER thought that overtreatment was responsible for much that was unsatisfactory. He never used styles and very seldom probes. In acute cases he considered the best treatment was to open the abscess and allow the case to quiet down, but if this failed he preferred to dissect out the sac.

Mr. ERNEST CLARKE thought that simple cases were best treated by dilating the canaliculus and syringing. He strongly condemned the use of large probes. In cases of stricture he recommended the slitting of the lower canaliculus and the removal of its ocular surface so as to accommodate a nail-headed gold style.

Mr. RICHARDSON CROSS saw no harm in slitting the canaliculus, and in severe cases he opened both. If a stricture existed, the

probe must be used, but he thought there was no advantage in using a large one.

Mr. SYDNEY STEPHENSON was convinced that in difficult cases there was nothing so good as large probes, and he preferred rapidly to dilate with Theobald's probes, the largest being 4 mm in diameter. Mucocèles in new-born children usually yield to pressure over the sac and evacuation of its contents.

Mr. MADDOX recommended the attachment of a simple nipple to the nozzle of a Weber's syringe for the injection of cocaine. When a style was indicated he advised the use of a soft one, such as the end of a fine silk catheter, which should be worn for a few days before placing a permanent metal one in the duct.

Mr. ENSOR, in severe cases, rapidly dilates under an anæsthetic with Couper's probes and then puts a lead style in.

Mr. WORK DODD drew attention to the importance of attending to the general health.

Remarks were also made by Mr. BLAIR and the PRESIDENT, Dr. BRAILEY.

Mr. BERRY, in reply, stated that he had never seen anything but harm arise from the use of large probes.

Mr. ERNEST CLARKE read notes of a case of **cerebral tumor with optic neuritis** in a man aged thirty-six. The right disc showed post-neuritic atrophy, while the left was a typical choked disc with 3 D of swelling but no hemorrhages. The presence of a tumor in the left frontal lobe was diagnosed. As the patient became rapidly worse, the skull was trephined by Mr. Arbuthnot Lane. The brain bulged greatly when the tension was relieved, but the patient died the next day. At the autopsy the tumor was found where it was expected, and it proved to be a **psammoglioma**.

Dr. FREELAND FERGUS read a paper on some forms of **optic-nerve disease, probably of sympathetic origin**. He related five cases in which injury to one eye was followed after a few weeks by contraction of the field of vision in the other. This contraction was always accompanied by a diminution in visual acuteness. In only one of the cases mentioned was there anything at all resembling an ordinary case of sympathetic ophthalmitis. He urged that in all cases of injury to one eye a close watch should be kept on the condition of the optic nerve of the other. This was to be done not merely with the ophthalmoscope but also by the constant examination of the field of vision and of

the minimum of light sense. Their two functions depend in part on the healthy condition of the optic nerve, and defects in them often showed lesions of the optic nerve before they could be detected with the ophthalmoscope.

The PRESIDENT asked if tension as a possible cause of failure of vision had been excluded. Remarks were also made by Mr. CROSS and Mr. BERRY. In reply, Dr. FERGUS said that he had carefully eliminated tension as a cause of failure. He thought that possibly the onset of an attack of sympathetic ophthalmia might be predicted by observations on the field of vision.

Mr. E. E. MADDOX demonstrated a stereoscope for the exercise of eyes after operations on the muscles, in which each eye could be shut off from seeing by means of small screens worked by electro-magnets inside the instrument. He also showed some new needles, with round holes for the suture, which could be threaded more readily than those of the ordinary pattern. For advancements he had had made some silk sutures, colored green and black.

SYSTEMATIC REPORT ON THE PROGRESS OF
OPHTHALMOLOGY IN THE FIRST
QUARTER OF THE YEAR 1900.

BY DR. ST. BERNHEIMER, IN VIENNA ; DR. O. BRECHT,
PROF. R. GREEFF, PROF. C. HORSTMANN, AND DR.
R. SCHWEIGGER, IN BERLIN ;

WITH THE ASSISTANCE OF

Dr. G. ABELSDORFF, Berlin ; Prof. E. BERGER, Paris ; Dr. SWAN M. BURNETT,
Washington ; Dr. DALÉN, Stockholm ; Dr. J. HERRNHEISER, Prague ; Prof.
HIRSCHMANN, Charcow ; Dr. KRAHNSTÖVER, Rome ; Mr. C. D.
MARSHALL, London ; Dr. P. VON MITTELSTÄDT, Metz ; Prof.
DA GAMA PINTO, Lisbon ; Dr. C. H. A. WESTHOFF, Am-
sterdam ; and others.

Translated by Dr. WARD A. HOLDEN.

Sections I.-III. Reviewed by PROF. HORSTMANN.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

1. HAAB. Atlas and essentials of ophthalmoscopy and
ophthalmoscopic diagnosis, with 149 colored and 7 black-and-
white illustrations. Third enlarged edition. Lehmann's hand
atlases, vol. vii. Munich, 1900 : J. E. Lehmann.

2. BIRNBACHER. The pathological histology of the human eye.
First portion, 5 plates. Leipsic, 1900 : Veit & Co.

3. WILBRAND and SÄNGER. The neurology of the eye, a
handbook for neurologists and ophthalmologists, vol. i., part ii.
Wiesbaden, 1900 : J. F. Bergmann. (Reviewed, vol. xxix., 2,
p. 256.)

4. GUTTMANN. The eye diseases of childhood and their
treatment. Berlin, 1900 : Fischer's medical bookhouse.

5. BERNHEIMER. The region of the nuclei of the ocular nerves. *Graefe-Saemisch Handbuch*, 16th portion, vol. vi. Leipzig, 1900 : Engelmann.

6. SCHULTZE, OSCAR. Microscopic anatomy of the lens and zonula. *Ibid.*, 17.

7. GREEFF. Anatomy of the optic nerve and retina. *Ibid.*, 17 and 21.

8. v. HIPPEL. The malformations and congenital anomalies of the eye. *Ibid.*, 18 and 19.

9. WADSINSKY. Methods of examination and forms of eye diseases of the patients in the military hospitals. *Wojenno med. Journ.*, 1899, viii.-ix.

10. COHN. The print of eye journals from a hygienic standpoint. *Ophth. Klinik*, iv., No. 1.

11. KERSCHBAUMER. Sarcoma of the eye. Wiesbaden, 1900: Bergmann. (Reviewed, vol. xxix., 2, p. 254.)

12. HIRSCHBERG. The development of ophthalmology in the 19th century. *Berl. klin. Wochenschr.*, 1900, Nos. 3 and 4.

13. SCHMIDT-RIMPLER. Retrospect of a quarter century of ophthalmology. *Deutsche med. Wochenschr.*, 1900, No. 1.

14. WINDMÜLLER, ERNST. The ophthalmology of Alcoatim (1159). Fourth part. *Inaug. Dissert.*, Berlin, 1899.

15. SCHWARZWEISS, LEO. *Ibid.* Fifth part. *Ibid.*

16. ALLARD, EDUARD. *Ibid.* Sixth part. *Ibid.*

17. KAEMPFER, REINHOLD. *Ibid.* Seventh part. *Ibid.*, 1900.

18. BRONNER, WOLF. The ophthalmology of Rhases. *Inaug. Dissert.*, Berlin, 1900.

19. BRECHT. Annual report of the polyclinic. *Charité-Annalen.*, xxiv., p. 368.

20. BROOKLYN EYE AND EAR HOSPITAL. Thirty-first annual report, 1899.

21. PRESBYTERIAN EYE, EAR, AND THROAT CHARITY HOSPITAL OF BALTIMORE. Twenty-second annual report, 1899.

22. EPISCOPAL EYE, EAR, AND THROAT HOSPITAL OF WASHINGTON, D. C. Third annual report, 1899.

23. MANHATTAN EYE AND EAR HOSPITAL. Thirtieth annual report, 1899.

24. NEW YORK OPHTHALMIC AND AURAL INSTITUTE.

Thirtieth annual report, for the year ending Sept. 30, 1899. H. Knapp and others.

25. WELLS, D. W. Sight and hearing of the school children of Wellesley, Mass. *Journ. of Education*, Feb. 15-22, 1900.

26. COLLINS, TREACHER. The Erasmus Wilson lecture on the anatomy and pathology of the eye. *Lancet*, Feb. 17-24, 1900.

In the third edition of HAAB'S (1) atlas of ophthalmoscopy, nine drawings have been added, so that now the number of plates is 80.

GUTTMANN (4) in his book gives a short, plain presentation of the more important eye diseases of childhood. He discusses particularly the connection between eye diseases and general diseases, external conditions and school arrangement. Etiology, prophylaxis, and therapy are treated extensively, rendering the book valuable for the general practitioner.

v. HIPPEL'S (8) work is an exhaustive treatment of the malformations and congenital anomalies of the eyes, taking up first the malformation of various parts of the ball, then those of the entire ball, those of the lids, teratomata and dermoids of the ball, and, finally, anomalies of the lachrymal apparatus and color anomalies. We have now a comprehensive presentation of the subject.

WINDMÜLLER'S (14) dissertation contains the original text of Tractatus IV. of the ophthalmology of Alcoatim, an Arabian physician, whose work appeared in the year 1159. This portion is the pharmacological and therapeutical part.

Tractatus V. is taken up by SCHWARZWEISS (15). This contains the recipes for the innumerable collyria, powders, and salves.

Tractatus VI., taken up by ALLARD (16), contains recipes for dry eye remedies, which even in Alcoatim's day had long been in use.

KAEMPFER'S (17) dissertation naturally follows the last. It is a curious collection of all sorts of recipes for remedies to be used in the various diseases of the eye.

BRONNER (18) reports on the ophthalmology of Rhases, an Arabian physician of the 9th century. There are only seven of his books preserved, which treated of philosophy, astronomy, and chemistry as well as of medicine. The ninth book, devoted to special pathology, contains also an exposition of the diagnosis and therapy of eye diseases. It is this book which forms the subject of this thesis.

During the year 1899, there were treated at the Brooklyn Eye and Ear Hospital (20) 10,224 new eye patients. There were 1535 operations, of which 24 were simple extractions and 10 with iridectomy.

BURNETT.

During the year 1899, 6832 new eye cases were treated at the Baltimore Eye, Ear, and Throat Hospital (21). There were 2361 operations on the eye, all told. There were 56 simple extractions and 31 with iridectomy.

BURNETT.

During 1899 there were treated at the Eye, Ear, and Throat Hospital of Washington, D. C. (22), 987 new patients; 148 operations were done, of which 24 were extraction of cataract: 18 successes, 5 partial, and 1 failure.

BURNETT.

The number of new eye patients treated at the Manhattan Eye and Ear Hospital (23) during 1899 was 13,251. There were 3126 operations, of which 89 were simple extraction and 18 Gräfe.

BURNETT.

During the year ending Sept. 30, 1899, there were treated at the New York Ophthalmic and Aural Institute (24) 9434 new eye patients. There were 454 patients admitted to the hospital. There were 590 operations, the minor ones not counted; there were 125 extractions of cataract, 104 simple with one failure, 21 with iridectomy with one failure, 8 congenital (5 zonular), and 72 secondary cataracts were discised; no failure.

BURNETT.

WELLS (25) has examined the eyes of school children of Wellesley, Mass., 685 in number, and found 22 % had normal eyes optically, 63 % H. and H. astig.; 9 % M. and M. astig. The myopia was 7 % in the primary grade, increasing to 12 % in the high and grammar schools; 70 % of H. in the primary and 54 % in the high schools.

BURNETT.

COLLINS (26) takes up some of the chapters from the anatomy and pathology of the eye with special reference to embryology and comparative anatomy. The subjects treated are copiously illustrated with the results of original investigations and by the description of partly personally observed cases. The scientific importance of these lectures is such as to demand the study in the original and makes an adequate abstraction extremely difficult. Hence, an attempt will only be made to mention a few of the subjects and conclusions.

Xerosis of conjunctiva and cornea, due to the lack of moisture, and a cessation of the constant friction of the lids over the front of the eye in the act of winking, is an example of the ocular

mucous membrane taking on the character of the skin. In a case examined microscopically the superficial epithelium was not only found thickened, but there were numerous down-growing finger-like processes of epithelium. Dryness of the cornea after instillation of cocaine is due to the retraction of the eyelids from stimulation of the unstriated fibres of Müller. In glaucoma, the following changes are observed in the cornea according to the degree and deviation of the increased intraocular pressure: œdema; vesicles, composed of a loose network of fibres and branching cells between the epithelium and the ant. limiting layer; and the formation of fibrous tissue in this location, with processes breaking through the ant. limiting membrane. This fibrous tissue in depth of anterior corneal epithelium is similarly found in the transverse film of the cornea, and is probably brought about in the same way. Its typical position in the cornea is the result of the pressure of the lids on the cornea. The filamentary processes observed in filamentary keratitis are explained by their being the vertical ridge of cells remaining between two closely adjoining vesicles, which comes to the surface when the vesicles break. As the posterior epithelium of the cornea has been seen to produce in pathological cases a substance akin in structure to the hyaline layer of Descemet's membrane, it is now believed that the latter structure is normally derived from its endothelium. A case of the formation of a hyaline membrane on the anterior surface of the iris under the endothelium is described. The relative size of the cornea to the eyeball in man, compared with other mammals, shows that in man the cornea relatively grows smaller as the size of the eyeball increases, hence the space occupied by the filtration angle lessens relatively to the amount of contents in the globe. The topography of the parts about the angle of the anterior chamber also changes. The similarity in structure of the fibres of the ligamentum pectinatum to the hyaline layer of Descemet's membrane makes it probable that they are the product of the endothelium lining the space of Fontana. In cases of congenital glaucoma, the structure of the ligamentum pectinatum and relation of parts about the iris angle seem to have remained in the foetal condition and resemble that met in the lower animals. Bands of adhesions across the iris angle were found in some of these cases. As evidence that the ciliary body is the only source of intraocular fluid, the fact is brought forward that the intraocular pressure is not reduced when any of the other vascular structures

of the eye are excluded, as in total absence of iris, embolism of central retinal artery, complete congenital absence of choroid,¹ and after optico-ciliary neurectomy.

After describing the comparative anatomy and embryology of the ciliary body, the examination of a microphthalmic eye is given where the foetal vascular system persisted and the ciliary processes were absent. In microphthalmic eyes with cystic protrusions, Collins found nothing in the eyes examined pointing to an origin inflammatory in nature. A discussion of the occurrence of elastic fibres in the sclera follows. In a microphthalmic eye with malformations, Collins found hyaline cartilage in the sclera. Cystoid and bulging scars near the sclero-corneal junction after operations are of these kinds. The first, the cystoid cicatrix of v. Graefe, is a gap in the sclero-corneal tissue covered by conjunctiva and lined by a piece of atrophied iris. Collins is convinced that to form a permanent fistula in the sclera the edges of the wound must be lined by cells of epithelial character, otherwise they would unite. This lining may be furnished by the iris, or the ciliary process, or Descemet's membrane with its endothelial cells. In the second, a bulging scar lined by atrophic iris exists when a part of the sclero-corneal wound unites before increase of intra-ocular pressure takes place; necessarily no filtration is possible. The third, called a staphylomatous scar, occurs when the whole length of iris becomes prolapsed and the sclero-corneal tissue cannot reunite. The whole iris becomes considerably distended and forms a large grayish prominence. A typical case of panophthalmitis in an eye with a cystoid scar is given, and attention is drawn to the possibility of a serous or plastic inflammation befalling an eye with a cystoid scar or subconjunctival entanglement of iris. Two cases are reported. Collins believes that this possibility may explain the occurrence of sympathetic ophthalmia a long time after injury. Sympathetic ophthalmia may occur after operation of abscission, as in the case reported, where portions of the ciliary processes were found entangled in the scar and the site of inflammatory changes. The chance of subconjunctival entanglement of iris or ciliary body forming the path of infection at any time subsequently, likely to incite sympathetic inflammation, occurs to Collins to be perhaps one reason why wounds of the ciliary region are especially liable to be followed by the above complication. The decrease of sympathetic ophthalmia at the

¹ Case reported by A. H. Thompson. *Transactions Ophth. Soc. U. K.*

present day may be due to greater care being taken to avoid entanglement of the iris during operations and to remove any incarceration of uveal tract when present. Prolapse or tags of vitreous may also form the channel for infection. Membranes after cataract extraction, often interfering with sight, are due to a folding of the anterior lens capsule, to which is added any one or more of the following three conditions: (1) Retained lens substance, which becomes opaque and shut off from further absorption by proliferation of the capsule cells. (2) New growth of capsule cells. These cells proliferate and form large vesicular cells, or they may lengthen out into spindle shapes and into delicate fibres which form a dense laminated structure. This tissue is like that found in ant. polar cataracts, and chiefly occupies the folds of the anterior capsule. (3) Adventitious fibrous tissues may form from cellular exudate in iritis on anterior surface or in cyclitis on posterior surface.

ARNOLD KNAPP.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

27. V. AMMON. Diagnosis and therapy of ophthalmia neonatorum. *Münch. med. Wochenschr.*, 1900, No. 1.

28. BRECHT. Clinical contributions to the bacteriology of conjunctivitis. *Charité-Annalen*, xxiv., p. 368.

29. HAUENSCHILD. The bacteriology of conjunctivitis with special reference to school epidemics. *Zeitschr. f. Augenheilk.*, iii., p. 200.

30. GROMAKOWSKI. A contribution to the bacteriology of follicular diseases of the conjunctiva. *Arch. f. Augenheilk.*, xli., p. 197.

31. HESS. On congenital ocular cysts and their development. *Ibid.*, p. 1.

32. LANGENDORFF. On the relations of the superior cervical ganglion of the sympathetic to the eye and the blood-vessels of the head. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 129.

33. NICATI. A note on intraocular tension and the mechanism of the blood pressure in the capillaries. *Compt. rend. de l'Académie des Sciences*, Dec. 11, 1899.

34. BÄUMLER. On the question of deep infectious injuries of the eye. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 25.

35. HAUENSCHILD. Investigations on the action of the newer

antiseptics on infected wounds of the cornea. *Münch. med. Wochenschr.*, 1900, p. 146.

36. VOGEL, H. A contribution to experimental investigations on the entrance of soluble substances into the interior of the eye by diffusion after subconjunctival injection. *Graefe's Archiv*, xlix., p. 610.

37. GRÖNHOLM. Experimental investigations on the action of eserine on the exchange of liquids and the circulation in the eye. *Ibid.*, p. 620.

38. SCHMITZ. A test for simulation by using mirror writing. *Wochenschr. f. Ther. u. Hyg. d. Auges*, 1900, p. 162.

39. OHLEMANN. On balneotherapy in eye diseases. *Ibid.*, iii., No. 21.

40. HERTEL. Hydrotherapy in eye diseases. Text-book of clinical hydrotherapy. Jena, 1900: E. Fischer.

41. EALES. Ocular phenomena associated with Cheyne-Stokes respiration. *Lancet*, Feb. 24, 1900.

42. BULL, C. S. The significance of intraocular hemorrhage as to prognosis of life. *Med. Record*, Feb. 3, 1900.

In a hundred cases of ophthalmia of the new-born, v. AMMON (27) found the gonococcus but 56 times. Most of these were cases of late infection, from which it may be concluded that Crede's method cannot particularly diminish the number of cases. The pneumococcus plays an important rôle. The suppuration in such cases ceases suddenly after 3-5 days. According to v. Ammon's investigations neither nitrate of silver solutions nor protargol enter the tissues deeply enough to destroy the micro-organisms. He recommends the use of cold applications and washing out the conjunctival sac with physiological salt solution. After 3-5 days astringents may be used, protargol 10-20 per cent. being of value.

BRECHT (28) reports on a child with severe conjunctivitis, in the secretion of which he found pneumococci and later diphtheria bacilli. The child died of nasal diphtheria. He described also a case of benign conjunctivitis with pseudo-gonococci, a case of gonorrhœal conjunctivitis and rhinitis with gonococci in the nasal pus, and a case of gonorrhœal conjunctivitis which ended in panophthalmitis, necessitating enucleation. Suddenly an acute hemorrhagic nephritis developed which Brecht regarded as being due to the entrance of gonococci into the circulation.

HAUENSCHILD (29) examined 25 cases of acute conjunctivitis and found the pneumococcus 13 times. He gives the well-known symptoms of pneumococcus conjunctivitis. In a school epidemic he found the pneumococcus 8 times in 30 cases.

HESS (31) states that the congenital cysts of the eyeball arise as follows: The invagination and closure of the secondary vesicle take place in the normal manner. At the point of union the wall of the eyeball is not sufficiently resistant, and, yielding under the intraocular pressure, bulges out. The outer layer of the secondary optic vesicle follows this bulging and lines the inner surface of the cyst.

From a series of experiments, mostly on cats, LANGENDORFF (32) has found that after excision of the cervical sympathetic, the myosis, narrowing of the palpebral aperture, and sinking in of the ball may persist for years. After the excision the symptoms of paralysis of the sympathetic, particularly the myosis, are well marked. They gradually grow less marked and may entirely disappear or even pass in the other direction. In all cases this may be produced several days or weeks after the operation by narcotizing the animal or by sensory excitation; perhaps dyspnœa has the same effect.

The investigations of NICATI (33) were in regard to the relations of the intraocular tension to the atmospheric pressure. Under the pressure pump the intraocular tension increases in the rabbit. The latter effect is less marked in the adult than in the young.

BÄUMLER (34) treated three cases of deep infected injuries of the eye with the galvano-cautery, with good results.

HAUENSCHILD (35) has experimented with oxycyanide of mercury, nitrate of silver, carbolic acid, and protargol. The cyanide of mercury is a good antiseptic, but protargol did not come up to expectations.

VOGEL (36) made subconjunctival injections of bichloride of mercury, cyanide of mercury, and other mercurials, and found in the aqueous humor traces of mercury which at the most would have made a 1:100,000 solution. This naturally could have no therapeutic action.

HERTEL (40) discusses fomentations and douches, and the special indications for hydrotherapy in various ocular affections.

In a case exhibiting Cheyne-Stokes respiration reported by EALES (41) the pupils were stationary and somewhat contracted

during the interval. After the onset of the first four or five respirations each pupil began to dilate, and as the respirations increased in volume and rapidity they each became more and more dilated until finally they became widely dilated and remained stationary during the height of the cycle. As the respirations subsided during the decline of the cycle, each pupil gradually contracted more and more, until eventually, just before the respirations ceased, they became contracted somewhat and remained stationary till the onset of the next cycle.

ARNOLD KNAPP.

In the young, according to BULL'S (42) observation, hemorrhages into the conjunctiva, and even the retina, are not of grave significance. When, however, it passes into the vitreous it points to general vascular degeneration. In the old, however, retinal hemorrhages are of serious prognostic significance, especially as to apoplexy.

BURNETT.

III.—INSTRUMENTS AND REMEDIES.

43. DARIER. Ocular analgesics. *Bull. de la Soc. d'opht. de Paris*, Mar. 5, 1900.

44. PERGENS. Argyrosis of the conjunctiva from the use of protargol. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 256.

45. PICK. Remarks on the action of peronin on the eye. *Ibid.*, p. 45.

46. NEUSCHÜLER. The acetate of cocaine in cauterizations with nitrate of silver. *Suppl. al Policlinico*, 1900, No. 16.

47. SCRINI and ARTAULT. Nirvanin in ophthalmology. The value and the preservation of its preparations. *Arch. d'opht.*, xix., 12, p. 723.

48. AXENFELD. A new Westien binocular hand-loupe for preparing specimens for clinical purposes, with changeable pupillary distance and adjustable head-holder. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 20.

49. LANDOLT. A new stereoscope for re-establishing binocular vision. *Arch. d'opht.*, xix., 12, p. 689.

50. BERGER. Transformation of the simple loupe into a binocular and stereoscopic loupe. *Rev. génér. d'opht.*, 1900, No. 3.

51. PARENT. A new model of spectacles for patients who have been operated on for cataract. *Bull. de la Soc. d'opht. de Paris*, Feb. 6, 1900.

52. BONDÉ. A portable dark room with illuminating apparatus for ophthalmoscopic purposes. *Wiener med. Presse*, 1900, No. 4.

53. HINGINGA. Eviscero-neurectomy—a new operation. *Four. Amer. Med. Assoc.*, Feb. 17, 1900.

54. HUBBELL. The Maddox rod or phorometer, which? *Ibid.*

55. MEYERS. Electrolysis in granular disease of the eyelids. *Ophth. Record*, Jan., 1900.

56. MURDOCK. A note on ovoid glass balls. *Amer. Four. of Ophth.*, March, 1900.

57. ROY. Subconjunctival injections in certain diseases of the eye. *International Clinics*, IV., Ninth Series.

58. STEPHENSON. The practical application of largin in diseases of the eye. *British Med. Four.*, March 17, 1900.

DARIER (43) employed acoin and dionin in order to produce analgesia in painful diseases of the eye. A little of the drug in powder form is introduced into the conjunctival sac, where at first it causes burning, chemosis, and swelling of the lids, which require the use of a bandage. In three cases of iritis the pain was entirely relieved in this way. In iridochoroiditis the pain was not relieved. In various sorts of corneal disease the tension was reduced and pain relieved. Peronin and heroin are of less use in ophthalmology.

BERGER.

PERGENS (44) calls attention to the frequency with which argyrosis follows the use of protargol.

PICK (45) instilled a one to two per cent. solution of peronin. Immediately there was severe burning that reached its acme in four or five minutes. At the same time chemosis appeared, at first with injection and later without, the white swollen conjunctiva being elevated, wall-like, about the cornea. The pupil at first dilated and after fifteen minutes began to contract. An almost complete anæsthesia of the cornea began in the course of a minute and lasted half an hour.

To anæsthetize the cornea before using nitrate of silver NEUSCHÜLER (46) uses five per cent. solution of nitrate of cocaine, as the usual hydrochlorate is precipitated by nitrate of silver and rendered ineffective.

KRAHNSTÖVER.

According to the investigations of SCRINI and ARTAULT (47) nirvanin is inferior to cocaine, notwithstanding that it is less

poisonous and does not dilate the pupil, since it irritates the eye, and even in strong solutions does not always produce anæsthesia. It does not possess the antiseptic qualities attributed to it, for carefully prepared aseptic solutions soon contain micro-organisms.

V. MITTELSTÄDT.

In LANDOLT'S (49) stereoscope constructed for the purpose of facilitating binocular vision the stereoscopic figures are photographed upon transparent glass discs. The stereoscope is turned toward the sky, so that the image seen by the weaker eye is illuminated as much as possible, while the image seen by the other eye can be dulled with gray glasses until the visual impressions in the two eyes are of equal intensity and fusion is facilitated.

V. MITTELSTÄDT.

The portable dark room described by BONDI (52) consists in a screen which can be folded up. This is spread about the patient and the examiner, resting on their shoulders. The illuminating apparatus is a head-band with an accumulator placed on the patient's head with incandescent lamps to either side.

HINGINGA'S (53) modification of the operation of evisceration consists in adding an excision of the posterior part of the globe, including a portion of the nerve, through the anterior opening left after the excision of the cornea. A Mules glass globe can be applied if desired. The dangers of sympathetic ophthalmia are thought to be lessened.

BURNETT.

In a comparative experience of several hundred cases of all forms of heterophoria HUBBELL (54) finds the Maddox rod test more satisfactory and reliable than the phorometer.

BURNETT.

MEYERS'S (55) more extended experience in the use of electrolysis in granular disease of the eyelids since his first publication in 1891 has been very satisfactory, and he has now abandoned the use of any drug applications. Three or four punctures are made in each hypertrophy, and as many as twenty or thirty punctures may be made at a sitting. A current of one and a half to two milliamperes is sufficient.

BURNETT.

MURDOCK (56) uses balls of glass, ovoid in shape, which he places in the socket after enucleation, after the stump has healed, and over this fits the artificial eye. He claims this relieves much the sunken appearance of the orbit.

BURNETT.

After an experience of three years with subconjunctival injections ROY (57) believes that in infected processes of the cornea,

such as ulcers, etc., the method is quicker than the treatment usually employed. In chronic iritis it is better than in the acute form. In post-operative infection and panophthalmitis it is the best method we have.

BURNETT.

STEPHENSON (58) has experimented with largin, a new substitute for nitrate of silver, and comes to the following conclusions: "The application of largin even in concentrated form is painless, but when prolonged beyond a few weeks may stain the conjunctiva. It acts well in blepharo-conjunctivitis and in some cases of dacryocystitis. It is an efficient substitute for silver nitrate in any of the conjunctival inflammations associated with the Koch-Weeks bacillus, such as acute infectious ophthalmia and acute or subacute trachoma. It acts admirably as a temporary remedy after any of the operations commonly practised for the relief of chronic trachoma. In gonorrhœal ophthalmia, on the contrary, it is in my experience distinctly inferior both to protargol and to silver nitrate. In diplobacillary conjunctivitis, too, it does not succeed so well as zinc sulphate. In short, largin seems likely to gain a permanent place among the somewhat restricted number of remedies employed in every-day eye work."

ARNOLD KNAPP.

(*To be continued.*)

BOOK REVIEWS.

XIII. — Der Pemphigus u. die essentielle Schrumpfung der Bindehaut (Pemphigus and the Essential Shrinkage of the Conjunctiva ; a clinico-critical study). By Dr. E. FRANKE, Hamburg. Wiesbaden : J. F. Bergmann, 1900.

Nicely gotten-up 8vo of 111 pages, with a complete bibliography (119 numbers). In the historical introduction it is stated that WHITE COOPER¹ was the first to describe this rather rare and pernicious disease of the conjunctiva in a case of pemphigus vulgaris of the skin. WECKER² came out with another case ten years later, drawing also attention to a picture of disease which STELLWAG had published before that time in his *Lehrbuch der pract. Augenheilkunde* under the designation of syndesmitis degenerativa, supposed by Wecker to be the same affection. Again, ten years later PLÜGER³ collected the observations published up to that time, adding a few new cases. In the same year appeared an elaborate paper by ALFRED GRÄFE,⁴ with the heading Essential Shrinkage of the Conjunctiva, which name he chose because his own cases, showing the same picture of disease, were not accompanied by pemphigus elsewhere. STEFFAN⁵ protested against the separation of the same picture of disease complicated with affections of skin or mucous membranes from those where the conjunctiva alone was affected. Most German ophthalmologists up to the present time are on the side of Steffan, for instance SCHMIDT-RIMPLER⁶ in his excellent treatise, whereas many dermatologists do not agree with them at all. UNNA,⁷ in particular, emphasizes sharply that pemphigus of the skin may naturally give rise to similar affections of mucous membranes, but that a series of diseases described under the name of pemphigus conjunctivæ

¹ *Ophth. Hosp. Rep.*, 1858.

² *Klin. Mon. f. Aug.*, 1868.

³ *Ibid.*, 1878, p. 1.

⁴ *Arch. für Ophthal.*, 1878.

⁵ *Klin. Mon. f. A.*, 1884.

⁶ *Die Erkrankungen des Sehorgans im Zusammenhang mit Allgemeinen Krankheiten*, Wien, 1898.

⁷ *Histopathologie der Hautkrankheiten*, Berlin, 1894.

had nothing in common with pemphigus. In the earlier literature of the nineteenth century the disease has been described by many authors under the name of xerophthalmus, and was mostly considered as an extreme degree of conjunctival atrophy caused by the trachomatous process. Of such cases the reviewer has seen a certain number with ulcers without formation of vesicles, but also a few, all binocular, where there was a vesicular disease in the nose, pharynx, and mouth. After reporting his own (5) cases, the author gives extracts of all published cases (102). Then he reviews the material on hand. He finds formation of vesicles only in 14 cases; UHTHOFF thinks it to be present in 25 per cent. The seat of the vesicles is in the superficial layers of the epithelial stratum, *i. e.*, intra-epithelial. In a certain number it may also be deeper, so as to run its course without or with formation of scars. The characteristic sign of the disease is shrinkage of the conjunctiva, which is followed by partial or total symblepharon, as well as by both entropium and ectropium, occupying different places of the same eye; finally there will be more or less extensive ulceration, destruction, and cicatrization.

The most frequent complication is skin disease, 74 per cent., of the same nature.

The pathology is still insufficiently cleared up. SATTLER (Leipzig) found the whole sub-epithelial connective tissue infiltrated with a molecular mass, which accounted for the peculiar white-waxy aspect of the surface, but he failed to define the nature of this infiltration. GELPKE says that the membranes of the blisters consist of coagulated fibrine with enclosed leucocytes. BÄUMLER found in transverse sections of a hardened specimen, the anterior parts of the eye and lids (which had been removed together) without notable alterations.

DEUTSCHMANN found in the conjunctival tissue xerosis bacilli and small cocci resembling those contained in pemphigus vesicles, conditions to which the author denies any etiological significance, as LÖFFLER and other exact observers have failed to detect any bacteria in the liquid contents of the first vesicles.

The nosology of the disease is not clearly known. Even dermatologists, for instance NEISSER, pretend that the term pemphigus is still ambiguous, referring to different diseases, yet all authors agree that its essential feature is the presence of superficial vesicles without any or with only extremely insignificant inflammatory products in the deeper strata. In 26 out of the 101 well-constituted

cases the process was confined to the conjunctiva, in the remaining 76 the skin of the lids also was affected. In concluding this chapter the author says : " As long as dermatologists are not united as to the nature of pemphigus, we should replace this word by a clinical designation, adopting in the first place the essential shrinkage of the conjunctiva of Alfr. Gräfe, or, perhaps better still, we might call it *shrinkage of the conjunctiva with formation of vesicles*."

The prognosis is unfavorable (in our opinion — hopeless) *quoad visum*, and the treatment powerless. Collyria and operative procedures thus far have failed. The reviewer would say to his younger colleagues : There is work to be done in this desperate disease, and laurels to be gathered. We should begin with learning how to diagnosticate the affection in its early, possibly curable stage. We have to appeal to the general practitioner and to the dermatologist to give us opportunity to see cutaneous and mucous-membrane cases of pemphigus, and examine them with regard to ocular complications. To such as are willing to do this work, but not to such only, the elaborate monograph of Dr. E. Franke will be of great service.

H. K.

XIV.—Die operative Beseitigung der durchsichtigen Linse (The Operative Removal of the Transparent Lens). By Dr. E. PFLÜGER, Professor of Ophthalmology, University of Berne. Wiesbaden : Bergmann, 1900.

This monograph of 202 large-8vo pages, with an elaborate table of 101 cases, is the most extensive publication on the above subject, chiefly applied to the operative cure of excessive myopia. It is a German edition of a paper which appeared first in the *Comptes Rendus* of the French Ophthalmological Society. The bulk of the work consists in a description of each case operated on by the author, so that the reader may acquire a complete clinical experience (so far as reading can bestow) of this modern expansion of the cataract operation. Comprehensive presentation and discussion of all the questions on this subject make the long brochure most instructive.

H. K.

XV.—Schädel und Auge (Skull and Eye). A Study on the Relations between Anomalies of the Conformation of the Skull and the Eye. By Dr. FRITZ DANZIGER. With 7 figures on 3 plates. Wiesbaden : J. F. Bergmann, 1900. Mk. 2.80.

Fifty-six large-octavo pages, well printed, with a minimum of investigation and a maximum of speculation, introduced by four lines from Homer's *Iliad*, in Greek, not translated.

"Refraction, bulbus, and orbit are in a certain relation. The attempt to prove this proposition by measurements of the dimensions of the orbit has failed, but I have obtained by measurements of the skull the sure, positive result that refraction is in a definite relation to the conformation of the skull." The author considers the cause of the anomalies of refraction by a multitude of specious arguments. The hyperopia and the strabismus of the new-born depend upon a malformation of the skull brought about by compression of the skull during the passage of the head through the bony pelvis, which reduces the longitudinal diameter either alone or more strongly than the other diameters. Hence the hyperopia of babies, the most frequent cause of convergent strabismus, which disappears when the deformity gradually gives way to a more physiological shape of the head. In a similar way the anomalies of refraction are examined and accounted for, together with the mechanical causation of keratoconus, posterior staphyloma, and detachment of the retina and the vitreous, nystagmus, accommodation (spasm, paralysis), excavation and atrophy of the optic nerve. The seven figures are all outline drawings which in reduced dimensions might just as well have been put into the text as placed ostentatiously on three large plates. "All rights [as to reprints and translations] reserved." (!)

H. K.

XVI.—Physiologic Optics, Dioptrics of the Eye, Functions of the Retina, Ocular Movements, and Binocular Vision. By Dr. M. TSCHERNING, Adjunct Director of the Ophthalmological Laboratory at the Sorbonne of Paris. Authorized Translation from the Original French Edition, Specially Revised and Enlarged by the Author. By CARL WEILAND, M.D., Philadelphia. With 212 illustrations. The Keystone: Philadelphia, 1900.

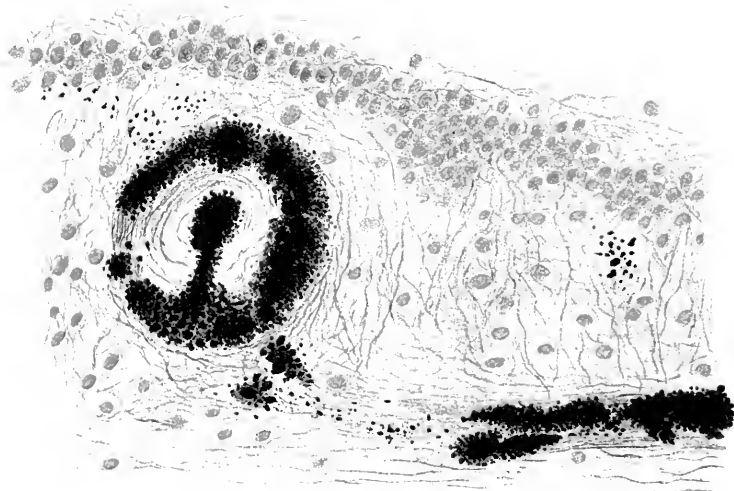
This is a very good school-book of 337 pages, treating of the practical part of the optics of the eye. Tscherning is a well-known scientist in this line, and C. Weiland had no difficulty in clothing Tscherning's work in good English; he would have had none if the book were loaded with mathematics. The author has, however, refrained from dealing much in mathematics: the simplest algebra and arithmetic, with a few geometrical constructions, are all he requires to make himself understood. The Keystone has done many an oculist a great service to bring out so useful a book, and the translator deserves credit for his correct rendition and easy style, evidence that he travelled over familiar ground.

H. K.

1.



2.



3.





ARCHIVES OF OPHTHALMOLOGY.

THE CAUSE OF A SPECIAL FORM OF MONOCULAR DIPLOPIA.

By FREDERICK HERMAN VERHOEFF, PH.B., M.D.,
PATHOLOGIST TO THE MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY.

(With three illustrations.)

EVERYONE is familiar with the monocular diplopia and polyopia resulting from certain forms of cataract, and also with that due to certain pathological malformations of the iris. Less well known, though much more common, is a form of diplopia occurring in many cases of astigmatism, or which may be brought out in the case of most normal eyes by placing concave cylindrical lenses before them. In fact this latter form of diplopia, so far as I know, has been discussed by few writers. In 1896 G. J. Bull,¹ of Paris, published an article that was largely devoted to a consideration of this subject. His theory as to the causation of this form of diplopia I believe to be erroneous, and it is my purpose here to offer a more satisfactory explanation.²

As regards the doubling of lines, this form of diplopia may be considered normal, for it occurs in the majority of normal eyes. The fact that it is not recognized more often is probably due to two causes, one being that each axis of the astigmatic charts now most used is made up, not of a single line, but usually of two or more lines; the other reason is that in the majority of instances the phenomenon is

¹ *Transactions of the Ophthalmological Society of the United Kingdom*, vol. xvi., p. 204.

² Parinaud, in Norris and Oliver's *System of the Diseases of the Eye*, maintains that it is this form of monocular diplopia that manifests itself in cases of hysteria and other nervous affections. His explanation of it is practically identical with that of Bull. Vulpian, in 1861, and Donders, in 1864, also described the phenomenon, and assigned a similar explanation for it.

most noticeable when the lines are blurred by rendering the eye hypermetropic, while it is the rule, properly enough, in using astigmatic charts to render the eyes myopic. Although the two or three stripes in the axis of an astigmatic chart render it impossible for the patient to realize that he may be seeing each of the lines double, nevertheless the doubling occurs, and may cause an inaccuracy to enter into the test for astigmatism. I always prefer single lines in my charts, for if there is any such phenomenon taking place I wish to know of it and to take special precaution against its leading to error.

The phenomenon may be well seen by most persons by viewing a narrow black line at a distance of about 30 *cm.* On relaxing the accommodation the line will be seen to break up into two. More striking, however, is the diplopia which may be produced by viewing the ordinary test type at 6 M through a concave cylindrical lens of 1.50 D or 2 D placed horizontal, or better still, through a stenopaic slit placed vertical and combined with -2 D S. If care is taken to keep the accommodation relaxed, the smaller letters will be seen in double rows one above the other, and entirely separated from each other. The larger letters will be seen to be double, but the doubling is not sufficient to cause complete separation.

Bull's explanation of this interesting phenomenon is that the sectors of the crystalline lens act as separate lenses and thus, when an image is blurred, produce diplopia and polyopia. By close attention Bull was able to distinguish other lines besides the two main ones into which a line was broken when blurred. I also have noticed these secondary lines, but prefer to speak of the phenomenon as that of diplopia, rather than polyopia, because diplopia is by far its most marked as well as its most constant feature.

There are several objections to Bull's theory. In the first place it seems unlikely that the lens sectors could have the required differences in focus without markedly impairing vision, but as a matter of fact the phenomenon may still occur when the vision is above normal. In my own case, for instance, the phenomenon is most distinct, and even

without the correction of a slight amount of astigmatism I have always vision of $\frac{20}{xv}$ and sometimes of $\frac{20}{x}$. Another most important objection is the fact that if a small black spot is blurred by relaxing the accommodation it is apparently converted into a more or less perfect ring. This would not be the case if Bull's theory obtained, for in that case it should be converted into a series of small dots. Again, according to Bull's theory it should be possible to place a line in such a position that there would be at least three equal or nearly equal images, but with me such is not the case, diplopia always remaining the predominating feature. If Bull's theory were correct it would be expected that a stenopaic slit could be rotated to a position at which diplopia could not occur, but with me such is also not the case.

To a certain extent I think Bull was misled by the study of what he called his "star." In viewing a very bright though small source of light, the very slightest deflections in the rays from it, while passing through the dioptric media of the eye, are rendered prominent, whereas in viewing a black line or black spot many such deflections are entirely invisible. Moreover, it seems likely that some of the so-called rays of a star are due to dispersion of light in the retinal layers, notwithstanding the fact that the latter are reduced in number and thickness at the macula. This is suggested by the fact that these rays are still plainly visible even when the source of light is viewed through a very small stenopaic opening, provided the source of light is sufficiently bright. I do not doubt that the appearance of a small blurred source of light is influenced in a more or less definite way by the structure of the lens, but it does not seem to me as if this influence is sufficiently marked or of such a kind as to play an essential part in the phenomenon under discussion.

By the use of a photographic camera I have made some experiments that go to show that the phenomenon is due solely to spherical or, more generally speaking, to symmetrical aberration. In making his photographs, Bull made use of the most perfect lens at his disposal, one corrected for

both spherical and chromatic aberration, and with this he was unable to reproduce the phenomenon in question. Now it is well known that these aberrations, in the case of the eye, instead of being corrected are, in fact, often exaggerated. I think that this fact renders Bull's entire series of photographs of much less value than if he had used a simple uncorrected spherical lens.

In my experiments I made use of a simple spherical lens, 11.5 *cm* in diameter and having a focal length of 26 *cm*. With it I was able to reproduce beautifully the diplopia of both lines and letters. To produce diplopia in lines, all that was necessary was to "focus" the camera so as to render it hypermetropic. It being difficult to obtain a sufficiently large cylindrical lens for producing diplopia in the letters, I

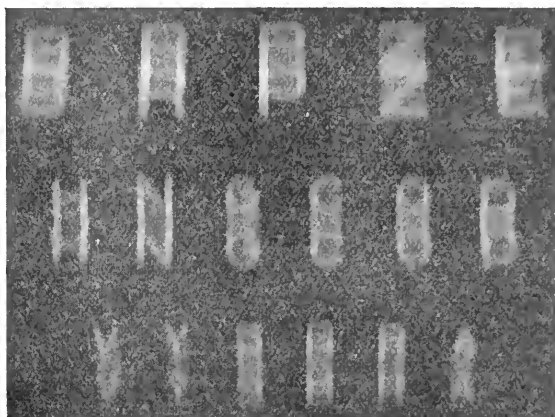


FIG. 1.

used the better method of the stenopaic slit, the latter being made 2 *mm* wide. Fig. 1 is produced from a photograph taken in this way. Black letters on a white card show the phenomenon almost as well on the ground glass of the camera as white letters on a black card, but the former letters do not come out so well on the plate.

Since this phenomenon does not occur when a lens corrected for spherical and chromatic aberration is used, it follows that it must be due to one or both of these aberrations. Chromatic aberration may be excluded by the fact that the phenomenon still occurs when a monochromatic

light is used. Knowing, then, that spherical aberration is alone sufficient to account for the phenomenon, and knowing how great is the symmetrical aberration of the eye, it would seem like folly to attempt to assign any other cause for it. It is not difficult to understand how symmetrical aberration produces this effect. Fig. 2 is intended to represent a case of positive symmetrical aberration; the rays from

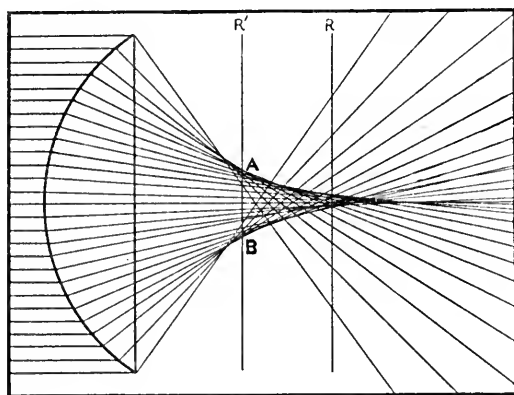


FIG. 2.

the peripheral portions of the lens therefore intersect at points nearer to the lens than the rays from the more central portions. When the retina is at R' , a condition of hypermetropia, it is evident that there will be two areas, A and B, that will be more intensely stimulated, either by an excess of light, as in the case of a bright object, or by a lack of light, as in the case of a dark object, than any other portions of the diffusion circle. This shows that a spot under these conditions would be represented on the retina by a ring, while a single line would be represented as two lines. If when the retina is at R' , and practically only one meridian is out of focus, a condition that could be produced by means of a concave cylindrical lens or by a stenopaic slit combined with a concave spherical lens, it follows that diplopia of any sort of an object, for instance a letter, must occur. If, on the other hand, the retina is at R or beyond, it follows from the character of the diffusion circle that no

diplopia could be obtained, and in the case of a spherical lens it can be shown experimentally that no diplopia does occur under this condition.

In the case of negative symmetrical aberration it is evident that the conditions are exactly the reverse of those just described. Here it would be necessary to render the eye myopic to obtain diplopia. Where the aberration is not symmetrical—that is, positive in one half of a meridian and negative in the other, a condition revealed by the scissors movement in skiascopy,—no marked diplopia could occur in that meridian.

Fig. 2 explains the well-known fact that test letters usually appear most distinct through a concave lens or when in any way the eye is rendered slightly hypermetropic, for it is evident that the edges of the letters, corresponding to A and B in the figure, are more sharply defined than when there is an emmetropic condition. I do not believe that heretofore this fact has been correctly explained.

It is not possible to reproduce with a spherical lens all the optical phenomena connected with the eye, for the reason that the refractive qualities of an eye can rarely be represented in a spherical surface. For instance, as already explained, when a myopic condition is produced in the camera, no diplopia occurs in either lines or letters. In my eyes, however, I find that this does not obtain, for under the myopic condition I still get diplopia, although far less distinctly than when the hypermetropic condition is produced. I at one time thought that this variation from the action of a spherical lens was due to the fact that the nucleus of the crystalline lens offered more obstruction to the rays than the periphery of the lens. I have explained elsewhere¹ how a sufficiently dense nucleus could produce diplopia, much in the same way that a pin held in front of the eye produces a white streak in the middle of a blurred line. A few experiments with my large lens, however, soon convinced me that this was not the true explanation, for to obtain an appreciable effect it was necessary to blacken the

¹ F. H. Verhoeff, "Shadow Images on the Retina," *Psychological Review*, Jan., 1900, p. 18.

centre of the lens to an extent which would be immediately noticeable if its equivalent occurred in the crystalline lens.

The true explanation, I think, lies in a peculiarity of the corneal or lens curvature. If there were positive aberration at the periphery of the cornea and negative aberration at the more central portions, diplopia would occur under both the myopic and hypermetropic conditions, as illustrated in

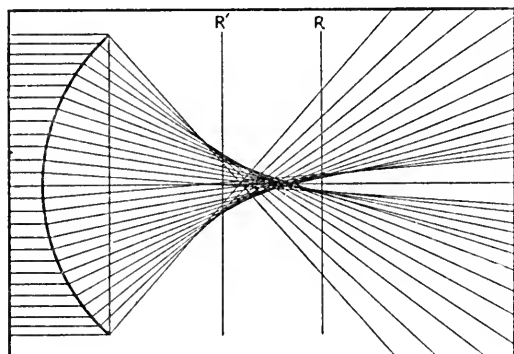


FIG. 3.

Fig. 3. I believe Fig. 3 to represent qualitatively the refractive conditions of the vertical meridians of my own eyes, with the exception that the two halves of each meridian are not quite so symmetrical as here represented. In support of this view is the fact that with me the diplopia occurring under myopic conditions is most distinct when the refraction is limited to the central portions of the dioptric media by means of a stenopaic opening, while, on the other hand, the diplopia resulting from the hypermetropic condition is most marked when the stenopaic opening is not used.

Finer lines than those mentioned, sometimes seen when a line is blurred, are most often due to tears flowing over the cornea, for they disappear or change their positions on winking. Other possible variations in the phenomenon no doubt could be produced by special peculiarities in the aberration of the eyes.

By sawing a lens into several sectors and then mounting the sectors together again, Bull was able to produce polyopia. It seems to me that this was a useless experiment, for

it must be evident to anyone that the sectors of a lens divided in this way could be mounted so as to give almost any degree of polyopia. This could not be done, however, without markedly impairing the definition of the lens. If the sectors of the lens were mounted so as to preserve their original relations, which would be a very difficult thing to do, the only factors that could possibly cause polyopia would be the lines of junction of the sectors, and these would not be wide enough to render the phenomenon noticeable. A study of the refractive structure of the crystalline lens by the pin-hole method does not reveal sufficiently marked lines of junction to account for the phenomenon, and the acuity of vision of the eye, as already brought out, excludes the idea that the sectors of the crystalline lens could act in the same way as the badly mounted sectors of a divided lens.

In case there was positive symmetrical aberration in one meridian and negative aberration at right angles to it, it is easy to see how astigmatic charts might give indications which would lead to the prescribing of a cylindrical lens where perhaps it was not needed. It is possible that a cylindrical lens would do no harm here, but it is likely that it should be opposite in sign to that which the tests as usually made would indicate. I am sure that I have met with cases which presented these features in a slight degree, but the latter were not sufficiently marked to admit of a great error being made. Where charts made with single lines are used, it is possible to detect the diplopia and to determine the real conditions, but when each axis of an astigmatic chart consists of three lines, the double images of the separate lines at times may reinforce each other and thus interfere with the correct determination of the amount of astigmatism.

I do not believe that these facts are sufficient grounds for doing away with astigmatic charts. On the contrary, I believe that when they are properly used, astigmatic charts offer the most accurate known method of measuring astigmatism, and even if the finer precautions are not taken, I think that fewer errors will be made than if the test letters alone are used.

ON THE HISTOLOGY AND DEVELOPMENT OF LENTICONUS POSTERIOR.¹

BY DR. S. BÄCK.

Translated by Dr. WARD A. HOLDEN.

(With three figures on Plate VI. of Vol. XXXVI., German Edition.)

ONLY recently has the interesting malformation of the lens known as lenticonus posterior been the subject of histological investigation, although clinically the characteristic clinical picture has long been recognized.

The first accurate histological examination was made by Hess (*Graefe's Archiv*, xlii., p. 234, 1896), who described the condition as follows: The anterior segment of the lens, the capsule, epithelium, and lens fibres are normally formed, and the arrangement of fibres and of their nuclei is normal. Just behind the point where the epithelial cells pass over into lens fibres, on each side, there is a slight incurving of the margin of the lens. Up to this point the capsule maintains nearly its normal thickness. Toward the posterior pole the capsule grows thinner without being broken. The fibres of this posterior segment are normal in appearance, although many of them are bent and distorted, and at many points masses of granular detritus lie among them. There was no trace of a hyaloid artery in this case or in another that was similar except for the fact that the masses of fibres were swollen and irregularly arranged. The capsule in this case also was much thinned posteriorly and Hess concluded that in the embryonic period there had been a solution of

¹ From the University Eye Clinic at Breslau.

continuity. There was no nucleus present ; at the posterior pole there was a slight cloudiness of the lens, visible ophthalmoscopically. In the other eye of the same animal there was an opacity at the posterior pole of the lens but no conus. Hess concluded that the same process which caused the disturbance in the development of the lens fibres at the posterior pole had decreased the resistance of the capsule at this place, so that, in one eye at least, it yielded to the intracapsular pressure and was forced backward. This view, that lenticonus posterior arises from a rupture of the posterior capsule which has taken place in embryonic life, was further discussed by Hess at the twenty-fifth Heidelberg Congress. In four out of five cases he had found this rupture. In all cases the nucleus of the lens was displaced backward into the conus, since the posterior fibres had grown out through the opening in the capsule.

Pergens (these ARCHIVES, xxviii., 6) described a case of buphthalmos with lenticonus posterior in man; there being also an anterior pyramidal cataract and posterior synechiæ. Furthermore, the cortex was completely broken down and the conical nucleus was dislocated toward the posterior surface of the lens, but it could not be determined whether this was primary or the result of the cataract.

The antero-posterior diameter of the lens was 7.6 *mm*, the transverse 9 *mm*. Pergens believed that the large size of the lens for a child of 4½ years was, in the sense of Priestley Smith's view, the cause of the hydrophthalmos. It should be mentioned, however, that in the other cases examined anatomically and in my case also there was no glaucoma in spite of the large size of the lens.

The condition of the posterior capsule could not be determined in Pergens's case on account of poor preparations. No remains of a hyaloid artery were found.

In the Heidelberg Congress of 1897 Bach showed several preparations from a case of lenticonus posterior in which the intimate connection between this malformation of the lens and the hyaloid artery was shown. In all of Bach's cases the posterior capsule was perforated and in one could be seen the piece of capsule that had been forced out, now

lying in the tract of connective tissue extending to the disc. Bach distinguishes between a lenticonus and a lentiglobus posterior.

I have myself found the same changes in a rabbit's eye while making experiments on contusion of the ball. This particular eye, however, had not been experimented on and was intended to be used as a control eye. In one eye there was an extensive rupture of the capsule of the lens, while in the other eye of the same animal, which also exhibited pronounced lenticular changes, there was no rupture.

The greatest breadth of the ball was 13 *mm*, the antero-posterior diameter, 11.5 *mm*; the greatest antero-posterior diameter of the lens was 8 *mm*, and its greatest lateral diameter 7 *mm*, while in a normal eye of a rabbit of the same age the antero-posterior diameter of the lens is 3.5 *mm*, and the lateral diameter 6-6.5 *mm*.

Thus the lens is markedly enlarged in all diameters, but more particularly in its antero-posterior diameter, on account of the extension of the lens toward the posterior pole of the eye. Even when but slightly magnified these posterior portions of the lens are seen to be somewhat split apart. Their limiting surface is irregular, but on the whole it presents a blunt, conical projection directed towards the disc. It is also clearly to be seen that the posterior portion of the lens is surrounded by delicate fibres which unite to form a tract which ends at the optic disc (Fig. 1, Pl. VI.). The masses of lens fibres pass to the apex of the cone, meeting at an acute angle. Where they meet lie irregular, dark, degenerated masses, forming a line in the lens running from before backwards. The enlarged, somewhat conical, and abnormally pale nucleus of the lens is elongated backward by following the direction of the lens fibres.

The capsule of the lens, in excentric sections from the upper third of the lens which do not include the conical projection, is, in its anterior half, normal, as are also the underlying epithelium and fibres; but toward the posterior pole pathological changes become visible. The fibres here lose their regular shape and become separated, spaces and masses of detritus appearing among the swollen fibres. These changes are well marked at the posterior pole. The fibres which meet here form a cone with its apex directed posteriorly toward the capsule, which here is thin.

Sections through the middle third of the lens show more

marked pathological changes, and the capsule of the lens is wanting at the posterior pole. The fibres pass through this opening in the capsule and are regularly arranged posteriorly, being surrounded by fibrillar tissue which makes up the tract extending to the optic disc (Figs. 1 and 2, Pl. VI.). Near the apex of the cone the fibres are broken down and the ordinary cataractous changes are present. The connective-tissue tract here loses its nuclei and passes in a diffuse manner into the optic nerve, neither containing vessels itself nor appearing to be in connection with vessels of the retina or nerve.

The extensive opening in the capsule leads one to regard this as the cause of the changes in the lens. The possibility that the capsule was ruptured in consequence of the change in the fibres is less likely.

It would seem then that the malformation of the lens has come about through changes in the posterior capsule. These were doubtless due to processes which took place while the hyaloid artery and tunica vasculosa lentis were undergoing absorption, for as the remains of such must be considered the fibrillæ about the posterior portion of the lens and the connective-tissue tract extending to the disc. It may be assumed that the strong traction on the posterior portion of the capsule led to a lessened resistance and a yielding at this spot. The lens fibres, developing, possibly extended toward this spot as one of least resistance, and thus the lens became unsymmetrical. But the cataractous condition of the posterior portion indicates that when the capsule ruptured, liquids entered and the lens fibres swelled up and protruded through the opening like a hernia. The enveloping fibrillar network, however, furnished a protection and prevented the absorption of the protruding fibres.

The condition of the lens in the other eye is of great interest. The eyeball was 11.5 *mm* in antero-posterior diameter, and 13 in lateral diameter; while the lens was 7 *mm* in antero-posterior and 7.5-8 *mm* in lateral diameter. The lens was thus abnormally large, particularly in its antero-posterior diameter; still there was no cone at the posterior pole.

The capsule with its epithelium and underlying fibres was normal in the anterior portion of the lens only. Toward the posterior

pole it became markedly thinner. The lens fibres, as in the other eye, came together posteriorly at an angle, whose apex was directed backwards (Fig. 3). At the posterior pole the fibres are separated and in part degenerated, enclosing among them vacuole-like spaces and masses of granular detritus. From the middle of the posterior pole a perpendicular cleft extends into the cortex, which also is filled with detritus. The capsule of the lens, however, is normal at this spot. The condition of the lens at the pole resembles that found in cases of fusiform cataract. No remnant of a hyaloid artery is to be found.

If we now compare the changes in the two eyes we may with a fair degree of certainty assume that the changes found in the second eye represent an earlier stage of the process existing in the first. Here also there was a diminution in the resistance of the posterior capsule; and here also the masses of lens fibres meeting at an angle and exerting pressure upon the weakest portion of the capsule greatly thinned the latter, but did not actually rupture it. Probably there was here also, in foetal life, an abnormal traction on the part of the hyaloid artery, but this did not continue since the artery became entirely absorbed; in the first eye remains of the artery continued and contracted, rupturing the capsule. My findings thus agree with those of Hess and Bach.

My thanks are due to Professors Uhthoff and Axenfeld for assistance in this investigation.

ON ELEPHANTIASIS LYMPHANGIOIDES OF THE LIDS.

BY DR. GIACOMO ROMBOLOTTI, MILAN.

Abridged Translation by Dr. WARD A. HOLDEN.

(With four figures on Plates X.-XI. of Vol. XXXVI., German Edition, and one figure in the text.)

THE term "elephantiasis," as Saboureaud justly remarked, has survived many analogous terms of the older medicine. It served to designate many forms of disease which now are more accurately classified, and to-day the term is used with reference to carefully defined morbid conditions, consisting in a marked increase in the volume of the affected parts of the body and in hypertrophy of all the cellular elements of the skin and subcutaneous tissues. From a clinical standpoint, many authors have differentiated a congenital and an acquired form. For the tropical forms the *filaria sanguinis humani* has been held responsible in many cases, but this of course could not be the cause in cooler climates.

Saboureaud, however, has discovered the micro-organism whose proliferation causes a recurring lymphangioitis which leads to pachydermia elephantisiaca. The constant statement of the patients that an erysipelas preceded or accompanied the affection or appeared during the so-called crises of elephantiasis led Saboureaud to study the matter and to examine serum and blood obtained by scarifying the inflamed part while one of the crises was existing. Cultures of the streptococcus of Fehleissen always were obtained. This was

what he expected to find, and he regarded the bacteriological examinations as explaining the clinical and pathological findings. Clinically, the affection is characterized by a paroxysmal course with the crises of elephantiasis, and intervals of rest and diminution of volume in the affected limb without full restitutio ad integrum. Pathologically, chronic lymphangioitis was found, which corresponds to the course of the affection and the genesis and site of the alterations. The streptococcus is the principal micro-organism. In elephantiasis of the lower extremities the recurrences are due in part to the dependent position of the limbs.

The case I wish to report not only furnishes a contribution to the pathology of this affection of which little is to be found in ophthalmological literature, but shows an evident clinical connection between a series of erysipelatous inflammations of the face and the development of elephantiasis.

Van Duyse,¹ in his paper on this subject, stated that he had not found this clinical sequence, and he believed that from birth there was a certain degree of tissue hypertrophy in those parts that later developed elephantiasis. He cited Walzberg's case in which the patient had at birth a hypertrophied eyelid which increased in size in consequence of repeated inflammations. Van Duyse believes that the repeated inflammations in certain cases are merely accidental and act upon an already existing congenital local predisposition.

The following cases, more or less analogous to mine, have been reported:

DeWecker, in his text-book, speaks of a woman whose lids became greatly swollen and pendulous without causing her any pain and without being preceded by any eruption or inflammation. Another negative case was reported by Tellais.² But it is not impossible that in these cases the condition of the lids was a local expression of a general leukæmia—such cases having been described by Leber³ and by Chauvel.⁴

Pedraglia and Deutschmann⁵ reported a case under the

Ann. d'ocul., 1889. ² *Arch. d'opht.*, 1882. ³ *Graefe's Archiv*, xxiv., 1.

⁴ *Gaz. hebdom.*, No. 27. ⁵ *Graefe's Archiv*, xxxiv., 1.

title "Chronic Œdema of the Lids with Erysipelatous Inflammation." The patient, a boy of fourteen, had suffered for several years from a bilateral swelling of the lids. The overlying skin had an erysipelatous redness. The authors attributed the chronic œdema to recurring attacks of erysipelas.

Lauraud¹ reported a case of chronic œdema of the lids in a boy of fourteen. The author believed the œdema to be due to a recurrent facial erysipelas.

Liebrecht² presented a patient with tumor formation limited to the lids. Leukæmia did not exist. The patient stated that he had suffered from frequent attacks of facial erysipelas, but that increased swelling of the lids never followed immediately after an attack. The diagnosis was left open. Behrend, in the discussion, pronounced it a case of elephantiasis due to recurrent inflammation.

Fage³ treated a woman who had had almost regular monthly attacks of facial erysipelas ever since her first menstruation at the age of twelve. By the time she was seventeen, the lower lids were so enlarged that they appeared to be two great tumors.

Analogous to this case is one reported by Polignani,⁴ who was the first to make a histological examination. The patient was a young woman who had had so many attacks of erysipelas that she could not remember the first. The lower lid was greatly swollen. When incised, an opalescent bloody-colored liquid could be expressed. Cultures of this liquid proved negative and inoculations in animals were not followed by infection. A bit of skin with the underlying tissue was removed and examined. The subcutaneous tissue was made up of a spongy meshwork-like tissue with scattered fibrous nodules. Two sorts of meshwork could be distinguished, one representing a dilatation of the lacunæ of the subconjunctival tissue, and the other, a closer-meshed tissue, representing a dilatation of the lymph vessels of the part.

¹ *Sem. mèd.*, 1889.

² *Deutsche med. Wochenschr.*, 1889, 50.

³ *Ann. d'ocul.*, 1892.

⁴ *Raccolta dei Lavori d. Clin. Ocul. di Napoli*, vol. iii.

The changes were due to a recurrent erysipelas. In the subcutaneous tissue there was a small-celled infiltration with a lymphatic œdema of the stroma and a secondary cystic and canal-like dilatation.

My case was as follows :

A. C., a woman of fifty, was received into the general hospital at Milan, September 14, 1894. The patient was healthy up to her nineteenth year, when she had an attack of facial erysipelas which repeatedly recurred after longer or shorter intervals. After several of the recurrences, an inflammatory swelling of the lids set in which only partially passed off and the lids became as large as they were at the time of her admission. An operation was then undertaken in order to relieve the deformity, but, the attacks of erysipelas still recurring, the lids became as large as before.

St. pr. : The lids, particularly the lower, are enormously increased in size and give one the impression of being dependent pockets attached by a broad base to the orbital margin (see photograph). The right pocket nearly equals the left in size. Its



vertical diameter is 30 *mm* and its horizontal 35 *mm*. The skin is smooth, very pale, slightly reflecting, and suggests the skin of an œdematous lid. When palpated the pocket is more resisting than simple œdema. On pressure it decreases in volume gradually and offers the same sensation as is obtained by squeezing

out a wet sponge. The free margin of the lid and the tarsal conjunctiva are slightly everted. The pocket overhangs the cheek so that the skin covering the former lies for 2 cm in contact with the skin of the cheek. Along this fold in each lid is a linear scar, concave upward.

Palpation of the entire orbital margin reveals nothing abnormal. The upper lids are deformed like the lower but in less degree. The skin of the upper lids resembles that of the lower. The eyeballs are normal in position and mobility, and vision is normal.

By pricking and then compressing the lower lids one can obtain a small quantity of a liquid which is at first transparent and later becomes tinged by an admixture of blood.

Examination of the lymph glands, viscera, and blood revealed nothing abnormal.

The director of the eye division of the hospital, Dr. Denti, operated on the right lid as follows: The skin was dissected up nearly to the free margin of the lid and several layers of the subcutaneous tissue removed until a smooth surface was obtained. The excess of skin was removed and the remainder brought into place. The result cosmetically and as regards function of the lid was excellent. The patient, however, left the hospital at once and no operation was done on the left side.

Histological examination: The portions of tissue removed from the lid were hardened partly in bichloride of mercury, partly in alcohol and bichromate of potassium, and were imbedded in paraffin and cut with a microtome. The sections were stained in various ways which will be spoken of later. A rapid glance at the specimens showed that the excised tissues consisted principally of skin and enormously hypertrophied subcutaneous connective tissue which reached a thickness of several centimetres. Only in the central and deeper layers of the tissues in some specimens were found muscle fibres, evidently from the orbicularis.

With a more careful examination it was seen that the same changes existed in both skin and subcutaneous tissue, although they were more marked in the latter.

The epidermis (Fig. 1, a,a,a, and Fig. 2, a,a,) has preserved its three layers perfectly, and it fills in the interstices between the papillæ regularly. In its deeper layers there is no sign of pigmentation—a condition always found in

elephantiasis,—whence the absence in the lids of the brown color usually found in elephantiasis of the extremities.

The papillæ are relatively atrophied and the limit between derma and epidermis is merely a slightly wavy line.

The chorion on the contrary is greatly thickened. Its component connective-tissue bundles retain in part the peculiar wavy course that they have in the lids, but their pupils are often separated by lacunæ containing a few cells (Fig. 2, b,b) and the tissue presents a markedly œdematous appearance. This appearance is still more marked in the deeper, more vascular layers (Fig. 2, c,c). Only in the neighborhood of a few of the vessels is there a slight round-celled infiltration.

The various glands exhibit no changes whatsoever.

The subcutaneous connective tissue (Fig. 1, c,c,c), as said before, is greatly thickened and œdematous. In the meshes of the connective-tissue network lies scattered a substance which is granular in places and fibrous in others, and does not take the ordinary stains well, but by the reaction to Weigert's stain this substance is shown to be fibrin.

A considerable number of pigment cells are found in this tissue, indicating that the normal pigment cells of the part have undergone a hyperplasia with the other elements.

The vessels (Fig. 2, f,f) are distended with blood, which in part explains the histogenesis of the connective tissue by hypertrophy.

Since it is generally believed that plasma cells (connective-tissue cells containing granules which take the methylene-blue stain) are found abundantly in tissues in which there is evidence of lymph stasis, I stained sections by Fiorantini's¹ method and found plasma cells present in much greater number than in normal tissue, and lying mostly about the vessels which in transverse section appeared completely encircled by these cells.

In the deepest layers of the subcutaneous tissue were small islets of fatty tissue, likewise containing plasma cells, and bundles of fibres of the orbicularis muscle (Fig. 3, a,a,a). The latter were separated by connective-tissue septa of fairly

¹ Atti della Assoc. medica Lombarda, 1895, No. 3.

uniform thickness, containing great numbers of fixed cells and infiltrating leucocytes (Fig. 3, b,b). This alteration in the orbicularis suggested that found in myositis interstitialis chronica, and the more so since the sarcolemma nuclei were very numerous. The fibres themselves often appeared separated from one another and surrounded by an empty space evidently produced by lymph stasis (Fig. 3, d,d). At other points it was found that the œdema had affected the fibres themselves, which appeared shrunken.

The sarcolemma nuclei are much more numerous than in the healthy state (Fig. 4).

The microscopic changes found in my case—the great number and dilatation of the vessels, the enormous hypertrophy and œdema of the subcutaneous connective tissue, and the accumulation of lymphoid cells and plasma cells—represent the residua of repeated inflammations, as the clinical history showed.

In general, my findings agreed with those of Polignani, although in my case there was no extensive network of lymph spaces lined with endothelium; but this absence may be explained by the fact that an operation had been done in my case four years before and the tissues I examined represented a reproduction of those originally present.

As regards the return of the elephantiasis while the causative factors still exist, I would say that in this case even after the second operation the lid in time again became as large as the other. For this reason many authors have spoken of elephantiasis lymphangioides of the lids as a neoplasm which is benign but, like other benign tumors, has a tendency to recur. Virchow, however, classes it as simple lymphatic œdema, and De Wecker as a hypertrophy of the skin.

The pathogenesis of elephantiasis lymphangioides is as follows: The immediate effect of the recurrent erysipelas is a dilatation of the blood-vessels, and particularly of the veins, which yield most readily. Thus the return flow is impeded and the serum of the blood passes out of the capillaries under the high tension, and this transudation

leads to œdema. If no fresh inflammation comes on, these pathological conditions may disappear, but if a recurrence takes place before the tissues have again become normal, the œdema becomes chronic, and the fresh hyperæmia causes a persistent stasis, and a vicious circle is set up. The transudation in the tissues then assumes new characteristics. It becomes denser and more fibrinous and finally it disturbs the nutrition of the part, increases its formative activity, and thus leads to the tremendous hypertrophy of integument and subcutaneous tissue which characterizes elephantiasis.

Conclusions : The formation of the hypertrophic tissues in my case is doubtless of lymphatic origin, arising from repeated lymphangioitis, which causes a permanent alteration of the lymph channels—the most important factor in elephantiasis. Each of these inflammations leaves its trace—an increasing number of cellular elements which gradually become organized and, together with the hyperplasia of the fixed tissue elements resulting from the disturbed nutrition, cause an ever-increasing hypertrophy of the tissues. As Saboureaud demonstrated for elephantiasis of the lower extremities, so also for elephantiasis of the lids the pathological anatomy is in complete accord with the ætiology, and the streptococcus is the pathological cause of the elephantiasis, this being brought about by the recurring attacks of lymphangioitis which are caused by the streptococcus.

Explanation of the Figures.

Fig. 1. Skin and hypertrophied subcutaneous tissue of the pocket in the lid.

a, a, a, epidermis.

b, b, b, derma.

c, c, c, hypertrophy of the subcutaneous tissue.

Fig. 2. Superficial portion of the section shown in Fig. 1, highly magnified.

a, a, a, epidermis.

b, b, connective-tissue bundles of the chorion, separated by lacunæ.

c, c, more marked lacunæ in the deeper layers of the chorion.

d, d, subcutaneous connective tissue with its fibres separated by lacunar spaces.

f, f, blood-vessels with an infiltration of lymphoid cells about them.

Fig. 3. a, a, bundles of fibres of the orbicularis muscle, separated by septa b, b, which contain infiltrating lymphoid cells ; c, c, transverse section of muscle fibre. The muscle substance, d, d, appears shrunken so that it is separated from the sarcolemma, e, e, by a narrow zone.

Fig. 4. Transverse section of muscle fibres in which the sarcolemma nuclei are very numerous.

ON ACCOMMODATION IN APHAKIC EYES.

BY DR. O. WALTER, ODESSA.

Translated by Dr. WARD A. HOLDEN.

THERE is no longer any question but that accommodation in the normal eye is due directly to a change in the form of the lens. This must be conceded by every one, whether he inclines to the Helmholtz theory or to that of Young-Tscherning.

From this fact it should follow that in an eye in which there is no lens there can be no accommodation, and this is the general opinion. The question arises, however, whether the anatomical structure of the eye is not such that under certain conditions lenticular accommodation may be replaced by another sort of accommodation.

Förster in 1872 first called attention to this matter when he reported his observations on several aphakic eyes in young people who had the power of seeing distinctly, with the same glass, objects at various distances. The view that this implied power of accommodation was at once combated by Abadie, Nagel, and particularly Donders. The last-named, together with his pupils, Baumeister and Coert, undertook careful control experiments which led to contrary results, and he explained Förster's conclusions as being due to errors of observation.

Among other conditions, Donders stipulated that in order to prove the existence of accommodation it must be shown that the patient's vision remained equally acute for various distances. In spite of this energetic reply to Förster,

Woinow in the same year reported some carefully observed cases of accommodation in aphakic eyes.

Against Förster and Woinow have risen up a number of observers, including Mannhardt, Schöler, Mauthner, Colin, Silex, and lately Davis. Silex reported a case in which remarkably good vision for near was obtained with the distance glass, and he explains this by supposing that the patient had an extraordinary facility in interpreting diffusion circles and perhaps used the periphery of his lens. Davis in a similar way explains the existence of accommodation in two of his patients.

Arlt, in *Graefe-Saemisch*, is not prepared to deny that there may be accommodation.

Fukala says definitely: "Young aphakic persons possess accommodation."

Schneller supposes that accommodation may be brought about in aphakic eyes by the pressure of the extrinsic muscles, especially in looking up and down, but Sattler after careful observations denies this.

In 1885, Bickerton reported a case in which he found good accommodation in an aphakic patient.

In a dissertation by Bickerton a series of observations are reported which quite agree with Förster's, and Litten expressed himself in the same way in 1896 at a congress of physicians at Carlisle.

My own case was as follows:

Victor B., aged twenty-six, employed in a mineral-water factory, came to me in January, 1896, complaining of so great short-sightedness that he was scarcely able to do his work. This was said to have developed ten years before, after an attack of typhoid fever.

On examination I found in each eye myopia of 16 D and extensive atrophic changes in the fundus (sclero-choroiditis posterior) extending round the disc. With the correcting glasses $R\ v = 0.1$, $L\ v = < 0.2$. In February I made a dissection of the right lens, following it with extraction through a corneal section made with the lance, no iridectomy being done. In April the left eye was operated on in the same way. The course was normal in each eye.

Since there was a secondary cataract on the right side, a dissection of this was made. The final result was as follows: On both sides a free round pupil, responsive to light, clear in the centre, with some secondary masses in the periphery visible by oblique illumination. $R\ v = 0.3$, with $+ 0.75c > 0.4$; $L\ v = 0.1$, with $+ 2.5c > 0.3$. For distance $+ 1$. could be added to the cylinders, but without improving vision.

With the right eye, with its correcting cylinder, the near point had come to lie at 28 *cm*, and at this distance the patient could read the Dahnberg's tests computed for 50 *cm*. He had, therefore, at this distance an acuteness of vision of 0.5 with his distance glass. The next larger tests, computed for 75 *cm*, could be read by the patient at 25-35 *cm*, which again corresponds to an acuteness of vision of 0.5.

With the left eye the patient could not read with the cylinder alone, but required the addition of $+ 3$. D, with which test type computed for 1. metre could be read at 30-40 *cm*, corresponding to an acuteness of vision of 0.3.

It is remarkable that in this case the same patient had two eyes of similar structure but of different function, the eye with poorer vision before the operation having better vision and the ability to see near objects with the same clearness as distant objects without being obliged to resort to a convex lens, as was necessary for the other eye. It should be noted again that a dissection of the secondary cataract was done on the first eye.

We find in the right eye all the conditions which Donders required for proof of the existence of accommodation, viz., the establishing of the fact that the acuteness of vision was the same for different distances. With the incomplete apparatus of the institute here I was unable to make the accurate examinations which Woinow made, and I was compelled to rely on the tests with Dahnberg's figures and hooks. I believe, however, that the comparison of the two eyes is sufficient proof that the patient does not extensively make use of the dispersion circles, since if he had done this with one eye he would also have done it with the other. And it must be accepted that conditions exist in the right eye (and are wanting in the left) which enable the patient to see both distant and near objects clearly with the same glass, for he

laid aside the convex glass given to him for reading, preferring to read without any glass whatever, since even the cylinder was of little assistance in near work.

In order to see clearly at different distances, an aphakic eye must either have the power of increasing or diminishing its refractive power, or the eye must be capable of lengthening and shortening its sagittal diameter, or, finally, it must possess the power of doing both.

The refracting power of an aphakic eye can, however, only be increased by increasing the corneal curvature or by increasing the refraction of the ocular contents.

Woinow, in his cases, was unable to find any increase in corneal curvature, even by the most careful ophthalmometric examinations. Davis thinks he found such changes. In my case I was unable to detect with the naked eye any change in the size of the corneal image of a flame.

Woinow admits the possibility, further, that refraction might take place at the anterior surface of the vitreous, but he dismisses this possibility by calling attention to the similarity in refractive index of the aqueous and vitreous humors.

It seems to me, however, that this possibility should not thus be summarily dismissed, for the investigations in regard to the refractive index of the vitreous have led to greatly differing results. According to Krause the index of refraction of the vitreous is 0.0065 higher than that of the aqueous. According to Chassat the difference is only 0.001, according to Brewster 0.0028, and according to Helmholtz 0.0017. Aubert and Matthiessen find the refractive index of the vitreous only 0.002 higher, and Hirschberg found it even 0.001 lower than that of the aqueous.

The latter investigator followed Abbé's method of putting a capillary layer of the liquid between the hypotenuse surfaces of two prisms. The vitreous, however, is not a liquid but a delicate, very watery tissue, and it is possible that the compression of the vitreous between the prisms changed its normal structure and thus its refractive index.

Furthermore, it is not a matter of indifference what portion of the vitreous is examined. According to Schwalbe

the vitreous is not a homogeneous tissue, but in man it is richer in fibre and poorer in liquid constituents in the periphery than in the centre; in animals the contrary is the case. It is, therefore, comprehensible that the refractive index may differ for different parts. Furthermore, we know that the consistency of the vitreous differs greatly in different persons and generally decreases with age.

On the ground of these theoretical considerations we may assume the possibility of there being eyes in which considerable differences exist between the refractive indices of the aqueous and vitreous, which would influence the refraction of aphakic eyes.

We would thus explain the accommodation in the following way: At the place where the lens formerly lay we have in the aphakic eye the anterior surface of the vitreous. Under the influence of the contraction of the ciliary muscles—*i. e.*, in accommodation—the choroid, according to Hensen and Völkers, is drawn forward, and perhaps the vitreous also, whose anterior surface is now pressed against the iris. We can conceive that under the influence of the contraction of the ciliary muscle and the choroid the cavity of the ball becomes smaller. In some cases the vitreous must be forced through the only open space—*viz.*, the pupil—and present in the anterior chamber. The presentation in the anterior chamber will vary according to the size and form of the pupil and the consistency of the vitreous. The condition of the iris will also play a rôle, since according to its degree of resistance it will be pushed forward with the vitreous or will act as a tense diaphragm offering a resistance to the periphery of the vitreous, thus increasing the protrusion of vitreous through the pupil. A similar rôle may be played by the posterior capsule of the lens or the hyaloid membrane, but with the opposite effect, since a greater thickness and resistance of these membranes would decrease the protrusion of the vitreous.

The form of the pupil must also be of importance because with a round pupil a spherical protrusion of vitreous would take place, but if an iridectomy had been done the protrusion would assume an ellipsoid form and an astigmatism

result, which, of course, under certain circumstances could correct a corneal astigmatism. In our hospital practice the patients have combined glasses prescribed but rarely, since they are mostly too poor to pay for them; and I now remember several cases in which a marked difference existed in distant and near vision, so that, for example, a patient with $v = 0.1$ for distance would read quite fine type when 3.D was added to his distance glass, and again, on the other hand, a patient with far better distant vision would be able to read large print near by only with difficulty.

That any power of accommodation should exist after a combined extraction is harder to conceive and I may cite the following observation:

A patient, aged twenty-eight, was operated on with iridectomy for soft cataract in each eye four years ago. After the operation pronounced iritis in each eye and formation of secondary cataract which has not been discinded. $R\ v = 0.1$ with $+ 11. D$; $L\ v = 0.3$ with $+ 11. D$ (cylinders improve but slightly). There is no trace of accommodation and the acuteness of vision rapidly diminishes as the test card is brought nearer. In this case the pupil was oval and there was secondary cataract—two unfavorable conditions.

Most authors who have admitted the existence of accommodation in aphakic eyes have explained this by a so-called outer accommodation from change in the shape of the ball; either an increase in the curvature of the cornea or an increase in the sagittal diameter of the ball from the pressure of the extrinsic muscles in convergence. Only in Woinow's paper have I found a hint as to an inner accommodation from increased refraction in the vitreous, but he adds that this is physically impossible. A fourth explanation does not suggest itself.

In order to get a conception of these problems it is, before all, necessary to obtain a clear idea of the changes which must take place in an aphakic eye in order to fulfil the conditions suggested. And to do this the best way seems to be to work out the physics of the matter, which so far has not been done.

We may consider the aphakic eye as a simple refractive system having two refracting media: the air and the aqueous humor; while the refractive indices of the cornea and of the vitreous may be neglected or considered equal to that of the aqueous. If we have an aphakic eye which, as in the case reported above, is nearly emmetropic, it follows that parallel rays impinging on the cornea will be united on the retina. Taking Helmholtz's third formula, for the refraction of the middle rays by a spherical surface (*Physiol. Optik*, 2d edition, page 62), we may first compute the length of the eye, *i. e.*, the distance between the retina and the cornea. The formula is:

$$\frac{n_1}{f_1} + \frac{n_2}{f_2} = \frac{n_2 - n_1}{r}$$

in which n_1 , the refractive index of the first refracting medium, the air, is 1; n_2 , the refractive index of the second medium, the aqueous humor, is, according to Helmholtz, 1.3365; and r is the radius of curvature of the cornea, which, according to Helmholtz, is for persons between twenty and forty years of age, on an average, 7.882 mm; f_1 is then the distance of the luminous point in front of the cornea, and f_2 is the distance of the image, corresponding to the distance of the retina from the cornea.

When the eye is focussed for its far point, or infinity, the equation becomes:

$$\frac{1}{\infty} + \frac{1.3365}{f_2} = \frac{1.3365 - 1}{7.882} = \frac{0.3365}{7.882} = 0.0426$$

or since

$$\frac{1}{\infty} = 0, f_2 = \frac{1.3365}{0.0426} = 31.3 \text{ mm.} \quad (1 a)$$

The retina, therefore, in such an eye when in a state of rest is 31.3 mm behind the cornea. Such an eye has an increased sagittal diameter, for normally the length of the eye is 23-26 mm according to Brücke.

If we wish to compute how much the sagittal axis of the eye must be lengthened to permit distinct near vision, while the radius of curvature of the cornea remains the same, f_1 will be the distance from the eye of the object viewed. Taking the ordinary reading distance of 30 cm or 300 mm, we get the equation

$$\frac{1}{300} + \frac{1.3365}{f_2} = \frac{1.3365 - 1}{7.882} = 0.0426$$

or,

$$\frac{1.3365}{f_2} = 0.0426 - 0.0033 = 0.0393$$

or,

$$f_2 = \frac{1.3365}{0.0393} = 34 \text{ mm.} \quad (1 \text{ b})$$

The retina, therefore, must lie 34 *mm* behind the cornea, or, in other words, when the object viewed is brought from infinity to 30 *cm* the sagittal axis must be lengthened 2.7 *mm* in order that distinct vision may be obtained.

After having in 1a obtained the length of the eye when focussed for infinity, we can, with the assistance of this formula, gain information in regard to other questions.

Thus, if one wishes to know how much the radius of curvature of the cornea must change when the object is brought from infinity to 30 *cm* and the retina remains where it was, we supply the known value and compare "r" as follows:

$$\frac{1}{300} + \frac{1.3865}{31.3} = \frac{1.3365 - 1}{r}$$

or,

$$0.0033 + 0.0427 = \frac{0.3365}{r}$$

or,

$$r = \frac{0.3365}{0.046} = 7.337 \text{ mm.} \quad (2)$$

Thus the radius of curvature of the cornea must be shortened from 7.882 to 7.337 *mm* to increase the refraction of the eye the desired amount.

With the assistance of this formula we can take up the third possibility and answer the question: How great must be the radius of curvature of the surface of the vitreous in the pupil, provided that this bulges forward with the contraction of the ciliary muscle so that a second refracting surface comes into play?

In this case we have the refracting surface no longer in the cornea but at the spot where the aqueous and the vitreous humors meet. According to Reich, the anterior

chamber, measured with the microscope in two eyes, is 3.673 *mm* deep; since now the lens is wanting and we have a deeper anterior chamber in the aphakic eye, we will suppose that the aqueous and the vitreous humors meet at a point corresponding to the centre of the lens. The lens, according to Helmholtz, being on an average 3.395 *mm* thick, this second spherical surface will lie 4.37 *mm* behind the cornea; f_2 , the distance of the focal point, would then be $31.3 - 4.37 = 26.93$ *mm* behind the refracting surface.

f_1 , the distance of the luminous point, must here be negative, since the rays emerging from a point 30 *cm* in front of the cornea are already refracted and rendered convergent by the refracting surface of the vitreous, and they converge, as we saw in 1b, to a point 34 *mm* behind the cornea, or $34 - 4.37$ *mm* = 29.63 *mm* behind the refracting surface of the vitreous f_1 is, therefore, - 29.63 *mm*.

Keeping Helmholtz's values for the aqueous and the vitreous humors, $n_1 = 1.3365$, and $n_2 = 1.3382$.

Introducing these values we have:

$$\frac{1.3365}{-29.63} + \frac{1.3382}{26.93} = \frac{1.3382 - 1.3365}{r}$$

or,

$$-0.045 + 0.05 = \frac{0.0017}{r}$$

or, finally,

$$r = \frac{0.0017}{0.005} = 0.34 \text{ mm.} \quad (3a)$$

That is, according to the supposition, the spherical projection of the vitreous must have the remarkably small radius of curvature of 0.34 *mm*. This could be possible, however, only when the pupillary opening through which the vitreous protrudes has no greater diameter than 0.68 *mm*, a pupillary diameter which is rarely seen.

This radius of curvature changes considerably when the index of refraction of the aqueous and that of the vitreous are altered in favor of the latter. If we use Krause values we obtain $n_1 = 1.3420$ and $n_2 = 1.3485$, and for r we get a value of 1.3 *mm* (3 b).

In this case the diameter of the pupil may be 2.6 *mm*, a diameter which is not rarely found.

From this it follows that the narrowness of the pupil which various authors have cited as the explanation of the apparent power of accommodation in aphakic eyes may act not only by cutting off the peripheric rays but also directly by allowing the vitreous projecting through the pupil to assume a spherical form with a corresponding small radius of curvature. We see also, from this, how important it is for the patient that he should have a round pupil, for in this case we are more likely to obtain a certain power of accommodation, which will be greater as the pupil is narrower.

If we now, with the results obtained, return to our questions, we come to the following conclusions:

I. If the accommodation of aphakic eyes, especially such as I have described, is caused by an increase in the long axis, this increase must be 2.7 mm for the reading distance.

An external accommodation caused by muscular pressure in the convergence position is claimed among others by Schneller. Schneller's investigations were subjected by Sattler to a most careful physiological examination, and Sattler came to the conclusion that no external accommodation takes place. His histological investigations of the sclera also led him to the conclusion that such a distension of the eyeball is improbable. In the present case it must be remembered that the eye was highly myopic, with an extensive sclerectasia, and doubtless an abnormal weakness of the coats of the eye, and particularly the sclera; it might be supposed then that the pressure of the extrinsic muscles would in this case be more likely to have some effect. Nevertheless a distension of nearly 3 mm is considerable, and it is doubtful whether this effect could be produced in the slight convergence necessary for fixing an object 30 cm away. Besides this, a portion of the radial fibres of the ciliary muscle run backward to the sheath of the optic nerve where they find their insertion, and a contraction of the ciliary muscle must bring the two points of insertion nearer together, thus shortening the sagittal axis. In my case it was incomprehensible why such an extension was possible in the right eye and not in the left when the pathological changes were alike in both. Finally, accommodation took place when the left eye was

covered and no effort at convergence was made, the left eye maintaining the position it had when fixing an object in the distance.

II. If the accommodation in aphakic eyes is due to an increased convexity of the cornea, the radius of curvature must be diminished 0.5 *mm* for fixation of an object at 30 *cm*.

In my case no change was detected in the corneal image of a flame by the coarse tests at my disposal, but no such change has been positively determined even by ophthalmometric examination.

An increased intraocular tension from compression of the eye could not cause such an increased curvature of the cornea, since, as we see in glaucoma, increased tension rather causes a bulging of the sclero-corneal ring and thus flattens the cornea. An increased curvature of the cornea could therefore be explained only through a contraction of the circular fibres of the ciliary muscle, yet, apart from the fact that such a result would be very improbable, there is no reason why such a result should occur in one eye and not in the other, since the condition of the cornea was the same in both. We therefore dismiss this explanation.

III. If the accommodation of aphakic eyes depends upon an increased refraction due to an altered form of the anterior surface of the vitreous, it can only take place when there is a marked difference in refractive index between aqueous and vitreous. Accommodation would then be favored by a round and narrow pupil and would be in inverse relation to the thickness and rigidity of the remaining posterior capsule or hyaloid membrane.

From the fact that the condition of the vitreous may be widely different in different eyes, we are also justified in believing that its refractive index may vary greatly, for the presence of even a greater or less quantity of salt in a liquid is sufficient to alter its refractive index.

With the assistance of this theory we are enabled to explain satisfactorily the difference in function in the otherwise similar eyes of our patient. A dissection of the secondary cataract was made in the right eye, the vitreous could communicate with the anterior chamber through this opening,

and, under the pressure of the ciliary muscle, could protrude unchecked into the anterior chamber. In the left eye, on the contrary, the hyaloid membrane remained intact, and there was a slight secondary cataract, two conditions which must greatly diminish any such play of the vitreous.

I am fully aware that there are many gaps in my argument and I do not wish to draw positive conclusions from a single observation and theoretical arguments, but I shall consider my purpose accomplished if others will test my observations and conclusions, and undertake an experimental study of the matter. The latter would include not only careful clinical examination of myopes and others who are aphakic, but the determination of the refractive indices of the media in a large series of cases. The vitreous should receive special attention since it is to be considered not as a homogeneous mass, and it should be studied entire. The conditions are now such that I cannot undertake such studies myself.

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REMARKS ON WALTER'S PAPER ENTITLED
"ACCOMMODATION IN APHAKIC EYES."

BY DR. TH. LOHNSTEIN, BERLIN.

Translated by Dr. WARD A. HOLDEN.

WALTER endeavors to make the idea plausible that in these eyes the ciliary muscle functionates exactly as in normal accommodation, while here it only causes a change in the form of the anterior surface of the vitreous. In the following paragraphs I wish to present briefly some considerations suggested by his arguments. To begin with, one misses the experiment which would naturally first be suggested, viz., the attempt to do away with accommodation in the aphakic eye by the use of atropine.

Walter conceives that during accommodation the surface of the vitreous protrudes in a spherical form into the anterior chamber, and he computes the radius of this sphere to be from 0.37 to 1.3 *mm*, according as the refractive index of the vitreous is considered to be 0.002 or 0.0065 greater than that of the aqueous. But Walter has overlooked the fact that refraction of such a hemisphere has associated with it a very pronounced spherical aberration. Taking the second and more favorable figure, the rays from an object at a distance of 30 *cm* would form a diffusion circle on the retina 2.8 *mm* in diameter—*i. e.*, almost as large as the pupil itself. Sharp optical images can only be obtained when the incident rays deviate but slightly from the optic axis. Even if in the foregoing case we contract the pupil to 1.9 *mm* while the spherical protruding surface of the vitreous retains its radius of curvature 1.3 *mm*, the diameter of the diffusion circles on

the retina will be reduced to 0.06 mm , but this is still too great to allow an acuteness of vision of 0.5.

In order to gain vision of 0.5, which Walter's patient possessed, other conditions remaining the same, the pupil could be at most only 1.5 mm wide. The conditions would be much less favorable, as Walter himself recognized, if the smaller figure representing difference in refractive index between vitreous and aqueous were taken.

The difficulty is done away with, however, if one gives up the view that the anterior surface of the vitreous is spherical. If one undertakes the problem of determining the form of surface that would lead to an accurate focusing of the refracted rays upon the retina, it is found that it will be a surface of revolution whose meridian curve would be represented by an equation of the fourth degree between the right-angled coördinates. The portion of this surface lying in the pupil would correspond sufficiently accurately to an ordinary paraboloid of rotation. The central portion of this would have, of course, the same radius of curvature as Walter's computed hemisphere. Here we have the advantage that, first, the relation of pupillary width to radius of curvature is eliminated, and second, with the slight difference between the two refractive exponents concerned a possible form of boundary surface will result. To discuss more in detail the form of this surface seems now useless, since it must first be determined whether it is anatomically possible for the action of the ciliary muscle to produce such a surface, and, furthermore, the refractive index of the vitreous must be more accurately determined. I will only say that forms will be obtained similar to those ascribed to the accommodating lens by the adherents of the Young-Tscherning theory.

If Walter believes that the amount of the salt component of the vitreous must considerably affect its refractive index, I would call his attention to Bömer's statement, that a one-per-cent. salt solution has a refractive index only 0.00146 higher than that of distilled water. Therefore the difference in the amount of salt present in different persons could alter the refractive index no more than ± 0.00015 .

AMAUROTIC FAMILY IDIOCY.

BY DR. MICHAEL MOHR,

OCULIST TO THE ADÈLE BRÓDY CHILDREN'S HOSPITAL, BUDAPEST.

Abridged Translation by Dr. WARD A. HOLDEN.

(With an ophthalmoscopic drawing on Plate XXIV. of Vol. XLI., German Edition, and three figures on Plate XXV.)

THE matter which I intend to discuss is not new. English and American authors saw cases of this sort as long ago as 1881, and continental oculists saw such patients now and then, but they were unable to explain the disease until Sachs, having observed several patients himself, collected the reported cases, and gave the disease its current name.

It is proposed to give a *résumé* of the papers already published, and then to present my own case, which was examined both clinically and pathologically.

1. Waren Tay's cases,¹ three in one family. The eldest child, a boy, was seen by Tay at the age of twelve months. At that time the discs appeared normal, but in the macular region was a broad whitish, nearly circular patch, with a sharply outlined brownish-red spot in the centre, forming a marked contrast to the whitish patch about it. This central spot does not resemble a hemorrhage or a collection of pigment, but looks like a perforation punched out of the whitish patch, through which one sees normal tissues. In fact, the picture is similar to that which we see in cases of embolism of the central artery. The infant had been growing weaker for some months before it was first seen, but there were no paralyses. Four months later the infant was unable to move. The patch at the macula remained as before, and the optic

discs began to shrink. At the age of twenty months the infant died.

2. The second of Tay's cases² was also in a boy, seen when several months old. The condition of the eyes was similar to that in the first patient. Neither as regards muscles nor nervous system could any abnormality be discovered, but in the sixth month the patient began to grow weak, and at the age of eighteen months it was brought to the hospital. It had convulsions. One day there were well-marked epileptiform spasms, the right half of the body was rigid, and the eyes deviated to the right. Two other attacks were observed. The optic discs were pale, and the macular regions were altered as in the first case. The weakness increased, and the infant died twenty-four days after admission.

3. Tay's third case³ was in a boy seen some weeks after birth. There was optic neuritis, but no general weakness. In the sixth month the changes in the macular region were fully developed,

Plates XXIV. and XXV. of Vol. XLI., German Edition, illustrating Dr. Michael Mohr's article on *Amaurotic Family Idiocy*, will be sent to subscribers as soon as received from Germany.

is, both in candre and in color, altogether normal. The fundus is of a fairly light red color, with the choroidal vessels easily distinguishable, the patient having light blond hair. The region of the macula lutea is of a pronounced milky-white color, and at the macula is seen the well-known cherry-red spot. The choroidal vessels are completely veiled by the whitish patch. Some small retinal vessels are readily distinguishable on the white patch. The changes are alike in the two eyes. When seen four months later the fundus appearance was the same.

5. Goldzieher⁵ demonstrated to the Medical Society of Budapest "a peculiar ophthalmoscopic picture in an infant." Media

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3. Tay's third case³ was in a boy seen some weeks after birth. There was optic neuritis, but no general weakness. In the sixth month the changes in the macular region were fully developed, and the discs had become pale. The patient was not followed later, but was thought to have died like the others.

4. Magnus.⁴ A girl of eighteen months, the first child of healthy parents, is unable to walk or even to sit up without support, or to hold up her head. The musculature is very weak. The head is of normal size, the fontanelles not yet fully closed. Hearing is normal, and the appetite good. The child has never suffered from convulsions, but it now has laryngismus stridulus, and is excessively nervous. It cannot be made to fix; the eyes are divergent and staring. The urine is free from albumen.

The color of the iris is dark gray, the pupils are of normal width, but react sluggishly. There is no limitation of mobility. The optic discs are quite pale, though rather yellowish than white. The temporal half is the paler. The vascular system of the retina is, both in calibre and in color, altogether normal. The fundus is of a fairly light red color, with the choroidal vessels easily distinguishable, the patient having light blond hair. The region of the macula lutea is of a pronounced milky-white color, and at the macula is seen the well-known cherry-red spot. The choroidal vessels are completely veiled by the whitish patch. Some small retinal vessels are readily distinguishable on the white patch. The changes are alike in the two eyes. When seen four months later the fundus appearance was the same.

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clear. Complete blindness. At the macula a patch two disc-diameters wide, of metallic lustre, with a red spot at its centre as large as a cherry-stone. Optic nerves atrophic. The rhachitic, poorly nourished infant had eclampsia at the age of six months. Hearing poor. The parents had not had syphilis, but there had been four miscarriages before the birth of this infant.

6. Knapp⁶ saw his patient in January, 1885. It was two to three months old, well nourished, but weak in muscle, and sluggish. The fontanelle was large and at times prominent. Vibratory nystagmus in both eyes. Form, position, and tension of the eyes normal; pupils narrow and reacting sluggishly to light. Media clear, optic discs pale. The cherry-red fovea centralis was surrounded by an intense grayish-white opacity, whose radial breadth was about two-thirds p. d. The opacity was densest and most cleanly cut at the fovea, remained uniform in the adjoining two-thirds, and then gradually faded out in the periphery.

Knapp had seen similar cases previously. In some cases there had been a congenital inflammatory affection of the optic nerves, with blindness existing or coming on later. In one case the picture was uncomplicated. This patient appeared in his clinic, and Dr. Born called his attention to the condition.

The infant⁶ was treated with calomel, massage, and later with iodide of potassium. It had a good nurse and was sent to the country in the spring and to the seashore in the summer. Its body developed slowly and the infant became stronger and less indifferent, but at times has trismus. Digestion and urine were normal. During the eight months that the infant was under observation the circumfoveal patch remained unchanged. In April the vision improved, while the nystagmus, which had increased in February and March, diminished, and objects were followed by the eyes. In the beginning of August the nystagmus had quite disappeared and binocular central fixation existed. The pupils were normal as regards size and mobility.

According to the original report the infant recovered, but Kingdon⁷ and Frost⁸ cited the case as having ended fatally when the infant was two years old. According to the latter account, only the brain was examined and changes were found in the large and small pyramidal cells of the cortex,

as well as atrophy of the convolutions from defective development.

7 and 8. Two cases reported by Wadsworth.¹⁰ In February, 1887, he saw a girl of eleven months, of Hebrew parentage, apparently well nourished, but unable to sit up or hold the head erect. Musculature so soft and thin that the spinal column could easily be felt. The head was well formed and the infant's facial expression was rational although indifferent. The infant never cried. Bowels sluggish, heart normal, knee-jerks present. The eyes were normal externally, and had normal mobility; the pupils were dilated, but responded promptly; vision poor. The discs were slightly grayish, the vessels normal. The centre of the macular region was dark red, surrounded by a whitish zone in which fine retinal vessels could be followed. This area was about $1\frac{1}{2}$ p. d. in diameter. The remainder of the fundus was normal. The condition was alike in the two eyes. The infant began to grow emaciated and to have spasms. The discs became gray, while the patches at the macula remained as before. The mother stated that this was her sixth child. The first four were strong and healthy. The fifth, born three years before, showed symptoms similar to those of the patient and died at the age of eighteen months. The father was healthy.

9. Sachs's case.^{11, 26} A girl seen at the age of three months. Knapp found vibratory nystagmus, and small pupils as is usual in infants of this age, transparent media, pale discs, and both foveæ cherry-red and surrounded by an intense grayish-white opacity. Knapp believed that there was failure of development. Finally complete atrophy of the optic nerves came on.

10. Hirschberg's case.¹² An infant of ten months, first-born (sex not stated), with failing vision. The infant was of a weak constitution, yet no internal disease could be discovered, apart from rachitis and idiocy. There was no history of syphilis. The eyes appeared to follow the light and the pupils reacted. About a red spot at the fovea was seen a bluish-gray zone $\frac{3}{4}$ mm broad which grew paler toward the periphery. Optic discs normal. Small pathological foci in the periphery of the fundus. Calomel was prescribed. Eight months later the infant was pale and ill and appeared to be almost blind. Fundi as before.

11 and 12. Tay's fourth and fifth cases.¹³ An eleven-months-old infant. Lies helpless in its mother's arms and cannot raise its head. Typical changes at the macula in both eyes. Discs slightly

gray. Vision apparently not reduced. The infant was the sixth and youngest of the family. The oldest child, a boy, exhibited the same symptoms and died at the age of fifteen months. Four other children are healthy.

13 and 14. Kingdon.¹⁴ The first of these was not seen by Kingdon personally. A first-born son, well developed at birth, gradually grew weak in the back and limbs. It became apathetic and blind and died in the second year. The second child of this family, born five years later, was healthy at the age of five years and a half. Kingdon's second case was in an infant of eight months, the third child of Hebrew parents, which was brought to the children's hospital at Nottingham on account of weakness of the back and limbs. It was healthy at birth, but began to grow weak at the third month. It was fairly well developed, with a considerable amount of fat, but soft muscles. It lay quiet, cried rarely, and frequently laughed without any particular reason. The skin when irritated became red, but otherwise there was but slight reaction to irritation or pain. The infant did not reach out for objects, and when objects were put into its hands it held them loosely. The back and limbs were very weak, the knee-jerks present. Thoracic and abdominal organs normal, eye muscles normal. For three weeks it had not appeared to notice objects. Pupils equal and responsive, media clear, optic discs pale, yellowish-white, retinal vessels reduced $\frac{1}{3}$ in calibre, neither hemorrhages nor tortuousness of the veins. In the region of the macula a grayish-white patch, twice as broad as the optic disc, oval in shape and indistinct in outline, with some retinal vessels in its periphery. In the middle of the patch is a dark cherry-red spot resembling that seen after embolism of the central artery. No other changes in the fundus. The infant gradually became weaker and died.

Autopsy (eighteen hours after death).—Posterior fontanelles closed, anterior nearly closed. Dura mater in the line of the superior longitudinal sinus fast adherent to the skull. Little cerebro-spinal fluid. Over the entire surface of the brain the sulci are widened. Arachnoid and pia mater not thickened, and readily detached. No meningitis. After hardening, the brain was examined, but nothing was found in the primary fissures and gyri. Various sections were studied, in which it appeared that the various layers of

ganglion cells could not be differentiated as readily as under normal conditions. The large pyramidal cells were almost without exception round or oval. The cell substance did not stain well with methylin blue, hematoxylin-eosin, or acid fuchsin. The protoplasm had lost its granular appearance, and a broad free zone was left about the nucleus. In the small pyramidal cells a similar change was found. Deiter's cells were increased in number, but it is questionable whether these were not altered pyramidal cells. The spinal cord was degenerated down to the second or third dorsal vertebra.

The eyes were examined by Treacher Collins. "It is extremely difficult to prepare microscopic sections of the macular region, and unfortunately a fold had formed in this region in both eyes." One eye was cut in celloidin. The retina, choroid, and sclerotic of the other eye were imbedded separately in paraffin and cut with a rocking microtome. The choroid was absolutely normal. The only abnormality found was a spacing out of the outer molecular layer as though there had been some localized œdema in this region. The other retinal elements appeared to be normal.

15. Sachs²⁸ in 1892 saw the development of the disease in a sister of the patient described as the ninth case.

16. Carter's¹⁵ patient was a girl of nineteen months, second-born. The elder infant had died at the age of seven months in convulsions. There was some consanguinity of the parents. The infant had been well up to the third month, when it began to be weak, although there was no paralysis. It cannot sit up or hold the head erect. It moves its limbs slowly. The muscles of the neck and extremities twitch from time to time. Pupils responsive. The eyes do not follow the light. Macular changes as in the preceding cases. Six weeks later the optic discs pale and atrophic.

The patient died two weeks after the last examination and an autopsy could not be obtained.

17. Kingdon's third case¹⁶ came from the same family as his first and second. It was the fifth child of the family, a girl. (The fourth, a boy, was quite healthy at the age of two years.)

At the third month the muscles had begun to grow weak but the eyes were normal. In the fifth month a suspicious cloudiness

appeared in the macular regions, and in the ninth month the typical changes had developed. The child died.

Both eyes were examined by Treacher Collins as reported in Frost's atlas.⁸ The optic nerves were atrophic. The proliferation of fibrous tissue among the nerve fibres and the increase in the number of round cells were remarkable. The cupping of the disc was due to the atrophy of the nerve fibres. No inflammatory exudation could be found in the intervaginal space. The central artery was full of blood, the vein empty; no changes in the vessel walls. The choroidal vessels corresponding to the macular region were dilated but presented no changes or evidences of inflammation. The retina in this region was thrown up into a fold and detached from the choroid. The retina here was markedly thickened in consequence of enlargement of the outer molecular layer, which presented cavities here and there evidently due to œdema. So far as could be discovered the other layers of the retina were normal, and save at the macula the retina seemed to be healthy.

18, 19, 20, and 21. Kingdon and Risien Russell¹⁷ observed four cases in children of Hebrew parentage; there had been three other children, one having died of the same disease and the other two being healthy.

The eyes were examined by Treacher Collins. The retina in the macular region was greatly thickened through hypertrophy of the outer molecular layer. This change was most marked near the fovea. Optic nerves atrophic, with proliferation of interstitial tissue. No inflammatory exudation.

In the central nervous system the changes were: extensive degeneration of the pyramidal cells, extensive degeneration in the fibres of the corona, the pyramidal tracts, and down through the pons, medulla, and cord.

22. Heimann's¹⁸ case was that of a first-born girl of fourteen months who could neither walk nor stand erect. Strouse examined the eyes and reported a yellowish-white patch at the macula, $1\frac{1}{2}$ p. d. in diameter, with a cherry-red spot in the centre. The optic disc exhibited signs of incipient atrophy.

It is noteworthy that this child was healthy up to the sixth month, and then became idiotic and began to lose its sight. The large fontanelle open; slight paralysis of the entire body; reflexes increased; ankle clonus.

23, 24, and 25. Higier's¹⁹ cases, of Hebrew parentage; no consanguinity. The mother had borne five children and was in good health during her pregnancies and the infants were born at term. The infant observed was the youngest. Of the other four two died of the same disease, one died of summer diarrhœa, and one is still living and five years old.

26, 27. Koplik's²⁰ cases. The first case was in a boy eleven months old, weighing fifteen and a half pounds. The mother, a Russian, was nervous. She had borne five children, all healthy. This infant had always been weak, and was bottle-fed. Five months before it had fallen and since then had grown weaker.

Dr. Cowan found the characteristic fundus picture. The infant was not quite blind.

The second case was in a girl a year and a half old, weighing seventeen pounds. The mother was a Russian, nervous, and had borne eight children, four of whom had died, but none with symptoms like the patient's. Father healthy. After the fifth month the infant became weak and stupid.

Dr. Cowan found the characteristic fundus picture.

28. Peterson's case.²¹ The patient was seen at the age of three months, and died in the eighth month of life. The brain appeared undeveloped, both macroscopically and microscopically. The nerve cells in the cortex and in the medulla were few in number and poorly developed, particularly in the region of the calcarine fissure, in the temporo-sphenoidal lobe, in the frontal lobe, in the motor zone, in the corpora quadrigemina and the corpora geniculata, and in the nuclei of the third and fourth.

No demonstrable changes in the fibres were found, nor imperfect development of the optic tracts.

29. Jacobi's case.²² A girl, one year old, of Hebrew parentage. Typical fundus picture with atrophy of the optic nerves.

30, 31, 32, 33. Koller's cases.²⁷

34. Strause's case,²³ cited by Sachs.

35, 36, 37. Hirsch's cases.²⁸ One patient was a boy, seen at the age of ten months, of healthy Hebrew parentage. The others were described by the mother as being affected in a similar way,

and dying respectively at the ages of eighteen and twenty months.

This patient seemed healthy up to six months of age, and then began to grow weak, so that it could not sit up or hold the head erect. There was perception of light and hyperacusis. Reflexes present, internal organs normal. The child grew weaker and died at the age of twenty-one months. Autopsy four hours after death. Macroscopic changes in the brain were not found. The fissures were normal, except that the second temporal fissure was abnormally long. There was degeneration of the pyramidal cells and also of the ganglion cells in the cord. The cells were swollen, the nuclei excentric, the processes and axis-cylinders diminished in size and broken down. The degeneration was complete in the cerebrum, cerebellum, optic tract, and chiasm. The blood-vessels and neuroglia were normal.

Hirsch considered the changes to be the result of some intoxication.

38, 39, 40, 41. Sachs's^{23, 25} cases, all in one family.

Our case is, therefore, the forty-second to be reported, the seventh examined pathologically, and the fourth in which the eyes were examined with a microscope.

The disease is characteristic. The child is healthy at birth, and for the first weeks, or even months, of its life.

After from two to eight months the parents notice that the infant is becoming apathetic, takes little notice of its surroundings, rolls the eyes about (sometimes there is nystagmus), and becomes weak, so that it cannot hold its head erect. It does not fix, and when examined with the ophthalmoscope the characteristic change is found at the macula. The weakness of the extremities increases, and the legs become more or less paralyzed. This paralysis is sometimes spastic, sometimes flaccid. In some cases there are no convulsions, in others these are severe, epileptiform, and sometimes increase until opisthotonus is brought about. The reflexes may be increased, normal, or decreased. Koplik, in one case, found a diminished reaction to the faradic current. The infant remains backward in psychical development, and toward the end of the first year complete idiocy develops.

At about this time the infant becomes blind quickly and dies, usually before the end of the second year of life.

According to Sachs, the chief symptoms are: 1. Mental deficiency, noticeably in the early months of life, leading to idiocy. 2. Weakness in all the limbs, resulting in complete paralysis, spastic or flaccid. 3. The deep reflexes may be normal, increased, or diminished. 4. Diminution of vision, leading to complete blindness (changes at the macula and later optic-nerve atrophy). 5. Marasmus and lethal ending, mostly before the end of the second year. 6. The disease affects several members of the same family.

Sachs reports the pathological findings in two cases, Kingdon¹⁴ in one, Kingdon and Russell¹⁷ in one, Peterson²¹ in one, and Hirsch²⁸ in one.

In Sachs's case the fissures of the brain were very well marked, and showed many peculiarities as regards course, such as one finds in brains at a low stage of development (confluence of the fissure of Rolando with the fissure of Sylvius, exposure of the island of Reil). The chief microscopic changes were in the large pyramidal cells. In many hundred sections only a few pyramidal cells with normal structures were found. Most of the cells were changed into a formless mass, the protoplasm degenerated, the nucleus and nucleolus in part altered, the nucleus often lying in the periphery of the cell. In Weigert preparations the number of fibres was seen to be reduced. The blood-vessels were normal and no signs of inflammation were discovered. In Sachs's second case the ganglia, the chiasm, pons, and medulla appeared normal. In the lateral tracts a degeneration could be followed down to the lumbar region. In the anterior tracts no changes were found. The retinas were not examined.

Kingdon found similar changes in the cortical cell. In the case reported jointly with Russell extensive degeneration was found in the fibres of the corona radiata and in the pyramidal tracts in their entire length, as well as in the fifth-nerve bundle and in the upper cerebellar peduncle. The changes were symmetrical on the two sides.

Peterson found, as stated above, defective development of the nerve cells.

Hirsch^{22, 38} found changes in the ganglion cells of the brain and cord without any œdema.

Sachs believed that the abnormally small number of pyramidal cells indicated a defective development of the brain, and that this was primary.

Kingdon considers the changes in the cord secondary, but Sachs regards them as due to defective development.

The etiology is unknown, but the family character of the disease is pronounced. Most of the infants affected have been of Eastern Hebrew parentage.¹

My own patient was first presented to the Royal Society of Physicians at Budapest as one of "*œdema maculæ lutæ symmetricum*." Prof. Goldzieher characterized it as amaurotic family idiocy, and such it proved to be.

G. Z., an illegitimate son of a Hebrew laboring woman, was admitted to the hospital May 26, 1898, aged a year and a half. The present disease began six months ago, before which time the in-

¹ The author here makes some citations from the translator's paper³⁹ which are rather garbled, and he therefore takes the liberty of stating his present views in his own words. The eyes of Dr. Peterson's patient and of Dr. Hirsch's patient were examined by me. No changes were found in the retina of Dr. Peterson's patient except post-mortem ones; and this case was probably one of idiocy with cortical blindness, a brother of the patient five years old being a blind idiot with weak muscles whose fundus I found normal and his pupils responsive, although the case had been reported a year before as one of amaurotic family idiocy.

Comparison of four such cases with a larger number of cases of typical amaurotic family idiocy has led me to believe that the former cases are not very rare, and that they may present the idiocy and the muscular weakness of the other cases, but that the patients *are blind from birth and have normal fundi*. These facts alone render the designation "*amaurotic idiocy*" unsatisfactory.

In Dr. Hirsch's patient the grayish patch was observed in life and could still be seen after the eyes were divided.

The retina usually becomes detached at the macula after death, and its elements are spaced out so that a deceptive appearance of œdema is presented.

Comparison with a number of other eyes seemed to prove that there had been no œdema in life in the eyes of this patient with amaurotic family idiocy.

All the ganglion cells of the retina were found to be enlarged and chemically altered so that they gave distinctive staining reactions like the altered ganglion cells of the central nervous system. In the normal eye the ganglion-cell layer is from 8-12 cells deep at the margins of the fovea; at a disc diameter from the fovea laterally, and a shorter distance above and below, it is but 3-4 cells deep, while farther from the fovea it rapidly thins down to a single stratum of cells. The oval grayish patch at the macula occupies exactly that region in which the ganglion-cell layer is four or more cells deep. The gray is densest just about the fovea where the ganglion-cell layer is thickest, and fades away into the normal-colored fundus where the ganglion-cell layer thins down. The simple atrophy of the optic nerve is doubtless consecutive to the degeneration of the retinal ganglion cells.—W. A. II.

fant could sit up and eat with its own hands. Since then it has become emaciated and idiotic.

The infant is poorly developed and poorly nourished, with manifest signs of rhachitis. The cranium is flattened from before backward, and the forehead is very low.

Both pupils medium-sized and sluggishly responsive to light. At the macula is a bluish-white patch $1\frac{1}{2}$ p. d. wide, which passes over into the normal fundus without a sharp line of demarcation. At its centre is a dark cherry-red spot $\frac{1}{2}$ p. d. in diameter. The disc is slightly pale and the vessels a little contracted (see Plate XXIV.).

The infant swallows with great difficulty and its food regurgitates through the mouth. Marked salivation. Thoracic and abdominal organs normal. When lying quiet the infant keeps both its wrists and elbows flexed, and it requires some effort to bring the arms to the normal position. The legs are fully extended, the feet having the pes-equinus position. A certain effort is required to bend the legs also. This spasm is equal in the two legs, but is more marked in the right arm than in the left. For a few minutes at a time the spastic condition relaxes. The infant cannot sit up, and when raised the head falls forward. All reflexes greatly increased. Hyperacusis. No fever. Poor appetite. Constipation.

Swallowing became more difficult. Constipation continued. The spasms increased. The pulse became fast and weak. There was at intervals some increase in temperature. Death occurred on July 14th.

Both eyes were enucleated at once.

The autopsy was made by Prof. Hugo Preisz July 16th. The brain was of medium size, the convolutions small, and the sulci wide and deep. The pia mater congested and serous in the frontal and parietal regions. The frontal and parietal portions of the cerebral cortex, and particularly the entire cerebellum, the ganglia, both optic thalami, and the centrum ovale in the portions near the fornix were of almost cartilaginous hardness. The cranium was thin. The sagittal and coronal sutures were not ossified, but were only indicated by a fine line. The spinal cord appeared somewhat condensed; in the lower dorsal portion the white substance of the lateral and medial tracts was somewhat

grayish and translucent. In the other organs, apart from the great emaciation, the anæmia, and the small size of the stomach, there was no pathological change.

Sclerosis congenitalis præcipue cerebelli, thalami optici, nucleorum cerebri utriusque et corticis præcipue lobi frontalis et parietalis.

*Histological description of the brain (Professor Schaffer).—*All the preparations, which were taken from all parts of the left hemisphere, showed an extraordinary diminution in fibres. The fibres of the corona radiata were remarkably disturbed. Weigert preparations stained pale gray instead of the usual black. In the cortex the radial layer was barely indicated. The supraradial layer was almost wholly without fibres, the tangential layer was represented only by one or two poorly formed fibres. The deep pyramidal cells and the polygonal cortical-cell layer exhibited fatty granular degeneration at the margins of the anterior and posterior central convolutions.

The region of the mid-brain: Conditions normal, except that the peduncle is very poor in fibres, so that the medial and lateral thirds are almost free from medullary substance, while the medullary substance is reduced in the central third.

Medulla: The pyramidal tracts lack medullary substance and the formatio reticularis lateralis is poorer in fibres than in its natural state.

Cord: The anterior columns are normal to the end. In the cervical and dorsal portions the cerebellar tract of the lateral column was normal while the other portions showed a diffuse degeneration of the fibres. In the lumbar and sacral portions of the cord the affection of the lateral columns was limited mostly to the pyramidal tracts. The posterior columns here were intact, Clark's column also, which corresponds to the fact that the cerebellar tracts were in the same condition. In the middle and upper portions of the dorsal cord there was a lack of fibres in the posterior columns which farther up in the cord affected only the column of Goll but in this column could be traced up to the nuclei.

Hematoxylin-eosin preparations of the cortical motor areas showed a great increase of glia tissue. The nerve cells were degenerated, the blood-vessels normal.

DESCRIPTION OF THE RETINA.

The eyes were enucleated immediately after death. The right was put into Flemming's solution, the left into alcohol for the Nissl stain, but the latter shrank up and could not be used for microscopic examination. The right eye was left in Flemming's solution for two days, then washed in water, and hardened in alcohols of increasing strength. Celloidin imbedding. Staining with safranin-picric acid and hematoxylin-eosin.

In the periphery the retina appeared normal. The macular region was elevated and nearly doubled in diameter. The ganglion-cell layer was thickened and near the fovea ten to twelve cells deep. The other layers were normal except Henle's fibrous layer, which was much widened in the region of the macula. It should not be forgotten that the fibres of Henle's layer may be artificially displaced in the normal retina, but when the changes were so marked as in this case, they must be considered pathological.

At the margin of the fovea centralis the internal molecular layer of bipolar cells forms a thin stripe, and next to it lies the broad layer of cone fibres (Henle's layer), Fig. 1, Plate XXV. The external molecular layer near the fovea is thickened and projects like a papilla almost beneath the floor of the fovea, Fig. 2. At this point Henle's layer is not visible. In some sections (Fig. 3), which apparently lie in the middle of the macula, the entire outer molecular and cone layers appear displaced toward the floor of the fovea. The spaces left in Henle's layer and that between the rod-and-cone layer and the choroid, where the macular region is detached, are all filled with a granular substance staining yellow with picric acid.

The cavities in Henle's layer (Fig. 1) are, in my opinion, an undoubted sign of œdema.

Both clinically and pathologically this case is seen to have been a typical one of amaurotic family idiocy. It is quite out of the question that this brain could have been abnormally developed in the beginning.

The positive result of the examination of the retina was the determination of the existence of œdema, chiefly localized,

at the macula, and destroying sight by softening the visual cells. The atrophy of the optic nerves appearing later is a secondary (perhaps descending) process.

It is evident that the condition of the macula, although it resembles the condition following embolism of the central artery, is not identical with it. I incline to the opinion that there is an angeoneurotic œdema. Frequent spasm of the vessels, even if not excessive, must leave its traces in the macular region, which has no vessels of its own. The existence of such spasm and its connection with the underlying disease are hard to prove, yet the fact that they constantly are found together indicates that the connection is a close and causal one. The following explanation may perhaps be satisfactory: The central artery of the retina, as a branch of the ophthalmic artery, arises from the internal carotid. The vaso-constrictors of the cephalic blood-vessels arise from the lower portion of the cervical cord, and passing upward unite with various nerves—those fibres intended for the eye, for example, with the trigeminus. I conceive that the pathological process which causes this angeospasm lies in the lower portion of the cervical cord, and pathological examination has shown that there are changes in the cord and medulla.

The conclusions at which I have arrived from a study of my own case and a consideration of the literature are as follows:

1. Amaurotic family idiocy is a well-defined, independent disease.
2. Chief symptoms: the infant is born normal and develops for some months or a year without any physical or mental disturbance; then it loses strength; the back and the extremities become weak; paralysis appear, sometimes spastic, sometimes flaccid; the reflexes may be normal, diminished, or increased. Vision is lost; in both eyes the typical white patch appears at the macula, with the cherry-red spot in its centre on which the diagnosis rests. Later the discs become atrophic. The strength continues to fail and the infant usually dies before the end of the second year of life. Usually several members of a family are attacked.
3. Anatomical changes: a great destruction of fibres in

the brain, medulla, and cord, particularly in the pyramidal tracts. An absence or rudimentary presence of the pyramidal cells, at some points fatty degeneration, hypertrophy of the neuroglia.

In the eye: œdema of the macula lutea, increase in the ganglion-cell layer, atrophy of the optic nerve.

My thanks are due to Professor Tangl, in whose institute I carried out my investigations, and to Dr. Vermes, who made the drawings for this paper.

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CONGENITAL DOUBLE PARALYSIS OF THE ABDUCENS AND FACIAL NERVES.

BY DR. EUDOXIUS PROCOPOVICI.¹

Translated by Dr. MATTHIAS LANCKTON FOSTER, New York.

HITHERTO the literature on this subject has been confined to the reports of five cases, which are in brief as follows:

I. Harlan, in the *Transactions of the American Ophthalmological Society for 1881*, under the title "Congenital Paralysis of both Abducens and both Facial Nerves," described the first case. The patient was a man eighteen years old. Both eyes were directed inward and a little upward. All the ocular muscles, except the paralyzed externi, possessed normal motility. There was complete paralysis of the muscles on each side of the face, the eyelids could not be closed, and there was epiphora. In other respects the patient was perfectly well.

II. In 1882 Julian J. Chisolm reported in the ARCHIVES OF OPHTHALMOLOGY a case in which a woman thirty-five years old had since birth had paralysis of the externi and of the muscles of the face. In very early childhood a myotomy had been performed on each internus to correct a marked convergence. No trace of strabismus remained, the movements of the eye upward and downward were good, but lateral movements were impossible. The skin of the face was smooth, and the only action of the facial muscles was to produce a few wrinkles below the angles of the mouth and on the lower lip.

¹ From Prof. Fuchs's clinic in Vienna.

III. In Graefe and Saemisch's *Handbuch der Augenheilkunde*, vol. vi., Graefe described another case. The patient was a man, twenty years of age. The paralysis was more marked on the left than on the right side of the face. Adduction was impossible on account of the paralysis of the abducens, but there was no strabismus. The movements of convergence associated with accommodation were performed with ease, but the interni could turn the eyes laterally only to an incomplete degree and with great difficulty. This condition had existed without change since the birth of the patient. Aside from itching of the hands and slight epileptiform attacks he was in other respects well.

IV. In 1888 Moebius contributed this case in the *Muenchener medicinische Wochenschrift*. A man fifty years of age came to the clinic in Leipsic on account of a paralysis of the extensors of both forearms, attributed to blood-poisoning. The first joints of his second and third fingers were united by a web. There was a paralysis of the muscles on both sides of the face, except at the angle of the mouth and the chin, and both external recti were paralyzed. The eyeballs were in proper position, though in looking downward there was a slight convergence. Whenever an attempt was made to turn the eyes laterally the externus of the one eye absolutely refused to work, while the internus of the other eye made with difficulty a slight motion toward the nose. When such an attempt was made very energetically the eyes converged and the patient fixed with the right eye in the attempt to look to the left and with the left eye in trying to see to the right. The same result was obtained when one eye was closed. Epiphora was present. The paralytic condition had existed since birth.

V. Schapringer reported in the *New-Yorker medicinische Monatsschrift* another case of what he called "congenital bilateral pleuroplegia." The patient was a girl eight years old, who had complete bilateral facial paralysis, except that the right angle of the mouth could be drawn downward and outward. When fixed for distance the axes of the eyes were parallel, though at times the right eye turned upward and a little outward. The movements of the eyes upward

and downward were good, but lateral movements could not be performed either with both eyes open or with one eye closed. Convergence was not interfered with. The patient had astigmatism, bilateral epicanthus, a bifid uvula, a strongly developed canine ligament, and a congenitally crooked left forefinger.

Lately I observed the following case in Prof. Fuchs's clinic, to whom I am indebted for the opportunity to add it to the foregoing:

VI. The patient was a girl seven and one half years old, the third child of her parents, born in the seventh month of gestation, an accident ascribed by her mother to a great amount of trouble she had to endure during pregnancy. The labor was without artificial aid. The malformations were present at birth and had never changed. Patient had had whooping-cough and measles, but never had had convulsions. Parents alive, healthy, not nearly related. Four brothers and sisters, all alive and not malformed.

The child was pale, rather slender, of the usual size for her age. The bones of her skull were rhachitic, the legs were slightly bowed and there was a slight dorsal scoliosis to the right. There was epicanthus on each side, more marked on the left, where it covered the lower punctum lachrymale, and epiphora of the left eye. Each abducens was paralyzed, while the other ocular muscles performed their functions properly. Gentle closure of the lids was incomplete, leaving a space 1.5 *mm* wide between them on the right side and 2 *mm* on the left, while firm closure was complete on the right side, but left a space 1.5 *mm* wide between the lids on the left. Both sides of the face were expressionless, as there were no wrinkles except the right naso-labial fold. The left side of the face was flatter and broader than the right. The bridge and tip of the nose were in the median line, but the bridge was flat and broad, the left half more markedly so, and the left nostril was smaller than the other. The distance between the inner canthi was greater than usual, and that from the inner canthus to the median line greater on the left side than on the right. The right angle of the mouth was drawn outward, while near the left angle the lower lip

was thick, puffy, and presented a delicate vertical fold from the stretching of the skin.

The teeth were very irregular, widely separated, ridged and carious, the left upper molars were absent, and the lower jaw was displaced to the right. The action of the temporal and masseter muscles was good. The tongue moved freely in all directions, deviated to the right when extended, and its left half appeared to be the smaller. The senses of taste, smell, and hearing were normal.

The electrical reaction was abolished in all the muscles of the face with the exception of those about the right angle of the mouth and chin, together with the right levator alæ nasi.

Both eyes converged; the left also turned upward. Movements in the vertical meridian were performed well by both eyes. Abduction was of course completely absent. When the patient attempted to look at an object placed at her right side without turning her head, the left eye turned still farther inward and upward and then returned to its former position, but if the object was placed at her left side the right eye turned readily inward and, at the same time, slightly upward. The results were the same when the tests were made with one eye covered, except that the action of the left internus was rather more energetic. These tests were made many times, and the observations, which were made very carefully, seem to show that this action of the interni was not that of convergence, as in Moebius's case, but rather that of the associated movements of the eye.

Nothing abnormal could be seen in the eyeballs or in the fundus, aside from a scleral ring in the right and a crescent on the temporal side of the left nerve. In both eyes there were astigmatism with the rule and a slight degree of hypermetropia. Some improvement was obtained in the vision by means of a $+1$ D spherical lens, but no more by means of cylindrical lenses. Lachrymation was free from both eyes in weeping as well as from reflex irritation.

The diagnosis, then, in this case was facial paralysis, complete on the left, incomplete on the right side, associated with a complete paralysis of the abducens of each eye.

The first problem to be solved is whether this condition was congenital. It is difficult to detect the presence of paralysis of the abducens at birth, because the infant is apt to keep its eyes closed, so when the paralysis is detected at a later period its development during the first months of life should be excluded. This paralysis might be produced by external injuries received during labor, either through direct pressure, or through the formation of hæmatoma involving the nerves, as in the case in which Seeligmueller observed a bilateral facial paralysis which had been caused by the pressure of the forceps, but usually such a traumatic paralysis is unilateral, unsymmetrical, and disappears after the lapse of a few weeks. In the case here reported labor was quite normal, and no support could be found for the idea that the paralysis developed at a later period on account of some hereditary disease. The mother asserted positively that the condition was noticed immediately after birth, and that it had remained unchanged ever since. Although the presence of this condition was in no case irrefutably demonstrated immediately after birth, and therefore it is possible that the paralysis occurred in one case before, and in another after delivery, this circumstance does not militate against the assumption that in all it was congenital, for all of them presented symptoms which indicated a probability that the paralysis had resulted from causes which had developed during foetal life. In all of them the two abducens muscles were completely paralyzed, while the facial paralysis was complete on both sides in Harlan's case alone; in the others some of the lowest branches of the nerve escaped. In most of the cases other slight abnormalities were to be found. Thus, in the case here reported, there was astigmatism and epicanthus; in Schapringer's, astigmatism, epicanthus, a cleft uvula, and a deformed finger; in Moebius's, webbed fingers, and in Graefe's there were disturbances of sensation and epileptiform seizures.

The axes of the eyes converged in the cases reported by Harlan, Chisolm, and myself, but were parallel in those of Graefe, Moebius, and Schapringer. It was demonstrated in Harlan's, Graefe's, and my own cases that the internal recti acted not only in convergence, but also to produce conjugate

lateral turning of the eyes, not indeed promptly in both, yet unequivocally. In Moebius's and Schapringer's cases this lateral turning of the eyes was impossible, and the interni responded only to the impulse to converge in accommodation. Chisolm's case cannot be taken into account in this respect, because a myotomy had been performed on both interni during early childhood and they had no motility.

These six cases may be divided into two groups: one to include those in which the eyes were directed forward, and the interni were unable to turn the eyes laterally, though able to act in accommodation; the other to include those in which the eyes converged and the interni were able to cause the eyes to perform the conjugate lateral movements as well as to act in accommodation. Graefe's case is the connecting link between these two groups, for in that the eyes when at rest had their axes parallel, and the interni were able to turn the eyes laterally, although, as Graefe says, with difficulty, and with all attempts premeditated. In the first group there was a paralysis of the lateral turners of the eye, in the second a paralysis of the abducens of the eye alone, in Graefe's case paralysis of the abducens with weakened interni. From this distinction may be deduced the differential localization of the lesions and the explanation of this diversity.

Foville and Fereol found that in diseases of the pons, in addition to other disturbances of innervation, the power of the muscles to turn the eyes laterally was destroyed, while the power of convergence remained good, whence Foville concluded that there is in the pons a common centre for the nerves which supply the externus of the same and the internus of the opposite side. Wernicke found in the left half of the pons a collection of tubercles which had destroyed the nuclei, and consequently had produced a degeneration of the abducens and facial nerves. Both eyes were turned to the right, and no movement of them to the left was possible. It may be deduced from these facts that the fibres of the oculomotorius which innervate the internus to produce the associated lateral motion of the eyes come from the abducens nucleus, perhaps in the following manner:

Nervous tracts under the control of the will extend from the cortex to the nucleus of the abducens of the opposite side, thence fibres pass to a part of the nucleus of the oculomotorius of the other side which innervates the internus. In addition to this there is a direct connection between the nucleus and the cortex which governs the movements of convergence.

If now there happens to be a lesion of these cerebral tracts between the cortex and the nucleus of the abducens, there will be an inability to turn the eyes voluntarily to the side, and yet there will be no peripheral degeneration; but if the nucleus of the abducens itself is involved, there will result a paralysis and degeneration of the abducens as well as an inability on the part of the externus supplied by it to abduct the eye. The rectus internus, on the other hand, will perform its functions of lateral motion well as long as the nerve fibres which pass near the nucleus of the abducens and control the conjugate lateral movements are not involved. If the focus of disease lies where the connecting fibres of the nucleus of the abducens pass to the nucleus of the oculomotorius on the opposite side, a central paralysis of the internus as regards lateral movements will result. This explains why in some cases there is simply a paralysis of the abducens, while in others there is also a paresis or paralysis of the internus as regards the production of the lateral movements of the eye. In one set of cases the lesion of the nervous elements is confined to the nucleus of the abducens; in the other it involves also the fibres which pass through the oculomotorius to the internus.

Duval and Laborde believe in the existence of a crossed relation of the oculomotorius to the nucleus of origin of the abducens on the opposite side through the fasciculus longitudinalis posterior—that is, that the nerve fibres leave the nucleus of the abducens at its cerebral pole and join the posterior longitudinal bundles. But farther on they appear to enter the tegmental region and, according to Nussbaum, to pass from the oculomotor nucleus to the other side in the commissura lemnisci, where, in its medial portion, the root fibres of the oculomotorius are to be met with. These are

the anatomical explanations for the physiologically concurrent action of the internus of one and the externus of the other eye, and they also indicate the seat of the lesion in such cases as these.

Diplopia was not present in any of the six cases because, as the paralytic condition of the abducens was congenital, the persons so afflicted either had never learned to see single with both eyes, or else they had learned at an early period to suppress one of the two images, and had then forgotten that they ever had had diplopia.

The paralysis of the abducens was associated in all six cases with paralysis of the facial nerve, either complete on both sides, or with the lower twigs exempted on one or both sides to a greater or less degree, and in the case here reported the right orbicularis also slightly retained its functional power.

One of the results of the facial paralysis in the sixth case appeared to be a faulty development of the bones of the left side of the face, similar to the atrophy observed in young rabbits from which the facial nerve has been extirpated. This was responsible for the epicanthus, and may also explain the distortion of the tongue and the non-apposition of the rows of teeth. The absence and caries of the teeth may perhaps be ascribed to the lodgment of particles of food, favored by the paralysis of the muscles of the cheeks. Further consequences of such a paralysis which may occur are the development of keratitis e lagophthalmo and of a paralytic ectropium.

Sometimes a double ophthalmoplegia externa is associated with a double facial paralysis, either limited to its upper branches¹ or involving the nerve completely.²

Experiments on animals and clinical observations render it probable that the fibres of the upper part of the facial, which supply the orbicularis and the frontal portion of the occipito-frontalis, spring from the posterior section of the

¹ Hanke, *Weiner klin. Wochenschrift*, xlv., 1894.

² Such a case has been observed in this clinic. The patient was a woman, thirty-four years old. The paralysis was congenital, more marked on the right side. Meynert found it to be a peripheral paralysis of all the branches of the facial nerve on the distal side of the Fallopian canal. The abducens was intact, the hearing good.

nucleus of the oculomotorius of one side and pass thence to the knee of the facial nerve. Mendel found a degeneration in the posterior part of the nucleus of the oculomotorius in rabbits when the muscles supplied by the upper part of the facial had previously been destroyed. No changes, on the contrary, are to be found in this nucleus after the entire root of the oculomotorius has been torn out. The following case, recently observed in this clinic, may be quoted in support of this point: A man of eighteen had a congenital, isolated paralysis, to an almost equal degree on each side, of the twigs of the facial nerve which supply the orbicularis and the frontal portion of the occipito-frontalis, and in all other respects was in a normal condition.

The nucleus of the abducens lies in the bend of the knee of the facial nerve, which forms the eminentia teres in the floor of the fourth ventricle, so that it is in immediate contact with that nerve in its ascending, middle, and descending portions, and it is evident from these close anatomical relations that a lesion which affects the nucleus of the abducens is apt also to involve the adjoining facial nerve.

The next question which arises is whether the lesion is a primary one of the nervous elements, or of some other nature.

The muscles might be primarily defective. Primary atrophy of the muscles of the face belongs to the class of diseases called by Erb *dystrophia musculorum progressiva*; it has been observed in the extrinsic muscles of the eye and levator palpebræ superioris, and Fuchs has shown that it may affect the levator alone. At a very early stage a differentiation might perhaps be made with the microscope between a primary muscular atrophy and one of neurotic origin, but after the lapse of years, as in these cases, muscle, nerve, and nucleus are all involved in the degenerative atrophy, and the same changes will be found, no matter where the primary lesion was located. But it is not credible that a primary atrophy of the muscles should thus occur on each side of the face throughout the region of distribution of two cerebral nerves whose nuclei and intracerebral fibres lie so close to each other.

When it is also borne in mind that in many of these cases the interni work well in convergence but refuse to turn the eyes laterally, it seems evident that the lesion must be central, and that it must be situated in the nuclei. An indication that this lesion is a primary one of the nuclei of both these nerves with a descending atrophy, is the absence of all symptoms which such paralyzes occasion when they result from diseases such as tumors, poliomyelitis, tabes, syphilis, acute infectious diseases, and alcoholism. In all such cases any doubt as to diagnosis would be cleared up by the development of the corresponding symptoms of the disease, while the effects of a primary lesion of both nuclei would be wholly confined to the region supplied by the two nerves. Hence Moebius has included all paralyzes which are congenital, or first appear during infancy, and involve the nerves which supply the muscles of the eye, either alone or in association with the facial, under the name "infantile nuclear atrophy."

When the accompanying faults of development, such as astigmatism, webbed or crooked fingers, and a bifid uvula, are taken into consideration as the possible results of an abnormal process of growth, the question arises whether the entire defect may not depend on an irregular formation of the nuclei of the nerves. In support of this theory is the fact that in each of the cases described there was a perfectly circumscribed set of symptoms, which, once developed, remained unchanged, and never passed to any other region, while the affected person remained otherwise in good bodily and mental health.

A few remarks in regard to the innervation of the lachrymal gland may not be out of place in this connection.

In the case here reported, lachrymation could be produced by irritation of the cornea, or of the nasal mucous membrane, as well as by psychical emotion, a fact which deserves consideration in view of the at present unsettled question of the innervation of the lachrymal gland. The experiments of Wolferz, Demtschenko, Reich, and Tepliachine on the lower animals have demonstrated that the maintenance of the normally moist condition of the surface

of the eyeball is probably under the control of the sympathetic, and that a flow of tears may be occasioned through some of the fibres which come from the cervical ganglion, but this does not explain the occurrence of lachrymation from a psychical or a reflex cause. That secretory fibres reach the gland through the lachrymal and temporo-malar nerves has been proven by anatomical dissections, and by the fact that excitation of these nerves will cause a copious flow of tears.

Tepliachine found, as a result of his experiments on dogs, that excitation of the peripheral end of the trigeminus, exposed and divided at its exit from the medulla, caused a secretion of tears, while no such result was obtained from the same treatment of the facial and glosso-pharyngeal nerves. He also found an increase of secretion when he irritated either of the lachrymal or the temporo-malar nerves, and he further supported his theory by two clinical cases of co-existent left-sided paralysis of the facial and trigeminus nerves, in which no lachrymation could be produced in the eye on the paralyzed side by either a psychical or a reflex cause, and he urged that this was on account of the paralysis of the trigeminus, because that would accord with the results of his experiments.

Goldzieher advanced the theory that the secretory nerve fibres come from the facial, through the great superficial petrosal nerve, to the second branch of the trigeminus, and finally reach the gland with the temporo-malar nerve, a theory which finds support in the fact that the facial supplies the salivary glands through its union by the chorda tympani with the lingual and by the lesser superficial petrosal with the otic ganglion. Reich divided the trigeminus at a high point and, contrary to the experience of Tepliachine, could not cause lachrymation by irritation of its peripheral portion, although this could be caused by reflex action. Krause resected a portion of the trigeminus close to the Gasserian ganglion to relieve a case of incurable facial neuralgia, and the lachrymal gland continued to perform its functions as well as ever. Goldzieher quoted several clinical cases of peripheral facial paralysis in which

there was no power of lachrymation, and Kiranow observed in this clinic a man with facial paralysis and deafness on the right side, occasioned by disease of the petrous portion of the temporal bone, in whom lachrymation could be produced by excitation of the peripheral twigs of the trigeminus, although it could not be produced by psychical emotion. These observations demonstrate that the function of the lachrymal gland is affected in certain peripheral paralyses of the facial nerve, so as to render it impossible to respond to psychical causes, and that reflex lachrymation is not under the same control as psychical.

The results of the experiments on the lower animals have been so unsatisfactory and contradictory that it is necessary as yet to rely on clinical observations for the solution of this problem. These favor the theory that the numerous connections which the facial, glosso-pharyngeal, and sympathetic nerves make in the petrous portion of the temporal bone with the ganglia in the neighborhood send secretory fibres for the lachrymal gland through the sphenopalatine ganglion to the second branch of the trigeminus. The fact that in peripheral facial paralysis the tears appear to be altered supports the theory of Goldzieher, but the secretory fibres do not come from the facial nucleus, for in the case here reported this was destroyed without injury to the function of the gland. It therefore seems probable that these fibres originate in a region which, according to Eckhard, lies, in dogs, between the place of exit of the trigeminus and the fifth cervical vertebra, called by him the seat of the centres of secretion, and that the connection of the facial with the centre of secretion may be found in the fibres which, according to Edinger, extend from the spinal root of the trigeminus to the facial, or in other fibres as yet unknown.

AN IRIDECTOME, A NEW INSTRUMENT FOR THE PERFORMANCE OF IRIDECTOMY.¹

By JULIUS WOLFF, M.D., NEW YORK,

VISITING OPHTHALMOLOGIST TO THE RANDALL'S ISLAND HOSPITAL; OPHTHALMIC SURGEON
OF THE OUT-PATIENT DEPARTMENT, MT. SINAI HOSPITAL.

(*With a drawing.*)

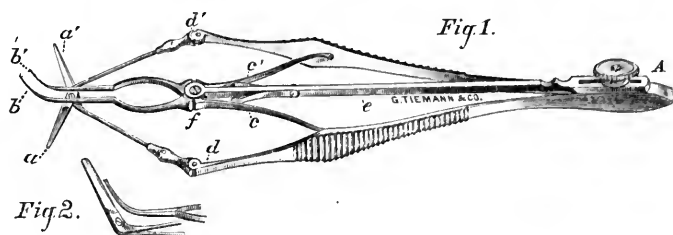
AFTER witnessing with other operators, and experiencing myself, some of the difficulties and shortcomings attendant upon the present method of performing iridectomy with various forms of forceps and scissors, it occurred to me that these difficulties could in part be overcome if a suitable instrument were devised that combined forceps and scissors in one. This idea, as I heard later from instrument-makers in Vienna and Paris, had already been put into execution some years ago, but the resulting instrument was entirely unpractical. The same cannot, I believe, be said of the iridectome represented in Fig. 1, p. 632, inasmuch as I have used it successfully in a number of cases.

DESCRIPTION OF THE IRIDECTOME.

The instrument consists essentially of a pair of Weiss's iridectomy scissors (*Add'aa'*), at the top of which (*A*) is attached the upper end of a slender steel rod (*e*) which can be adjusted upwards and downwards. At the lower end of this rod two pieces of steel (*cb'* and *c'b*) cross in a joint (*f*), their lower ends being shaped like the points of iris forceps, and the upper ends consisting of plane steel springs (*c*, *c'*)

¹ Presented at the meeting of the Section on Ophthalmology and Otology of the New York Academy of Medicine, April 16, 1900.

which are pressed against the inner surfaces of the branches of the scissors by two smaller springs attached to the rod *e*. When the instrument is in a relaxed state, the tips of the forceps (*b, b'*) stand about 3-4 mm apart and are below the



blades of the scissors, as seen in Fig. 1. This allows the introduction of the forceps into the anterior chamber without interference on the part of the scissor-blades. By unscrewing the button at *A* the forceps can be separated from the scissors, which facilitates the cleaning of the instrument and allows the scissors to be used alone like ordinary iridectomy scissors.

The mechanism of the iridectome is as follows: Pressure with the fingers upon the branches (*Ad, Ad'*) produces three separate results in this order: (1) the forceps-tips (*b, b'*) are brought together; (2) the relative position between the forceps-tips and scissor-blades is reversed, inasmuch as the latter pass below the former; and (3) finally the scissor-blades come together. The instrument then has the appearance as shown in Fig. 2. The various parts of the instrument are so proportioned that the closing of the forceps is completed while its tips are still *below* the scissor-blades, thus allowing the forceps to be introduced into the anterior chamber *closed*. Furthermore, the scissor-blades do not come together until the raising of the forceps-tips above them has been completed. When the pressure of the fingers is relaxed, the iridectome, by the elasticity of its steel springs, is at once restored to its original condition. The size of the piece of iris cut out will depend upon the amount of space between the forceps-tips and the scissor-blades when the iridectome is closed. This space can be varied from almost complete

contact to a distance of nearly 4 mm by means of the vertical adjustment of the rod (*e*) at *A*.

MANNER OF USING THE IRIDECTOME.

Before the operation is begun, the space between the forceps-tips and scissor-blades should be examined when the iridectome is closed, and should be made to correspond to the dimensions of the intended iridectomy. But very little experience with the instrument will teach the operator the proper adjustment for a certain desired effect. After the corneal or scleral section has been made, the operator takes the iridectome into either hand, choosing the one he finds more convenient, while with the other he fixes the eyeball. The iridectome should be held between the tips of the thumb and index and middle fingers, while the ulnar side of the hand is supported on the patient's forehead, thus securing complete steadiness. The seizing of the iris, which is the next step, is done just as with the ordinary iris-forceps, that is, with slight pressure of the fingers the forceps are closed, then introduced into the anterior chamber, relaxed sufficiently to grasp the iris, and again closed with the iris caught. It is important not to seize the iris at its pupillary margin, but rather at its middle, otherwise the coloboma may not be sufficiently peripheral. The caught iris is then drawn upwards, *not by further closing the iridectome, but by raising it as a whole*. In this way the operator can determine, before making the excision, whether the iris is yielding as much as he expected and whether his adjustment of the iridectome is correct. If not, it is not too late to make a change. But if all is well, he completes the operation by compressing the iridectome till it is closed and the portion of iris has been cut off. Though it has taken many words to describe the operation with the iridectome, not more than two or three seconds need elapse from the moment the iris is seized till the completion of the excision. The three steps of catching, drawing out, and cutting the iris are executed by the simple movement of bringing together the thumb and fingers of the hand holding the iridectome.

ADVANTAGES OF THE IRIDECTOME.

The advantages presented by the iridectome over the use of separate forceps and scissors, as they appear to me, are as follows: The combination of the two instruments in one leaves one hand of the operator free. He can therefore dispense with an assistant, inasmuch as he can fix the eyeball himself, and thus one hand less is needed around the small field of operation. Fixation by the operator himself has the further advantage of allowing prompter action in case of an emergency, since one mind can produce a quicker response than two, particularly if the assistant is not trained in that kind of work. Furthermore the iridectome is very easily handled, and as the operator can rest the whole ulnar side of the hand on the patient's forehead he gains greater steadiness than in the bimanual manipulations necessitated by the present method. Inasmuch as the scissors of the iridectome are already in place when the iris is grasped with the forceps, the interval between catching and cutting the iris is considerably shortened, a point which is of importance when the patient is restless or the iris sensitive. Finally, since the forceps and scissors have a definite relation to each other, the operator is more certain than with the present method, of obtaining a coloboma of a definite size, not larger nor smaller than he expected it to be. Not infrequently an operator, trying with the present method to perform a narrow optical iridectomy or only to fenestrate the iris, finds a wide coloboma resulting. This could not happen with the iridectome if it is so adjusted before the operation that, when the instrument is closed, the forceps almost touch the scissor-blades.

The above-named advantages of the iridectome have clearly appeared in five cases in which I was able to put it to a practical test. Three of the iridectomies were performed in operations for senile cataract, one for complicated cataract, and one for optical purposes in adherent leucoma. In the first case I seized the iris at the pupillary margin and the resulting coloboma was not as peripheral as I should have liked to make it. In the other cases, however, the

action of the iridectome and the operative results were entirely satisfactory.

LIMITATIONS TO THE USE OF THE IRIDECTOME.

Although the iridectome seems to me to possess the above-named advantages over the use of separate forceps and scissors in *most* of the conditions for which iridectomy is performed, I wish to emphasize the fact that it is *not* suitable for *all* cases of iridectomy. In general the contra-indication to its use may be said to exist in those cases in which the operator cannot foresee, before the operation, how the iris is going to act and how much it will yield to the traction of the forceps. If there are old and extensive posterior synechiæ, if the iris is widely adherent to the cornea, or if it is atrophic and friable, it may be impossible to know what adjustment to give to the iridectome before the operation, and therefore it is better in such cases to employ separate instruments. But even in these cases there is *no danger* in the use of the iridectome provided the operator bears in mind the directions given above, namely, that the iris should be drawn up in the same way as with the ordinary iris-forceps, and that he should not cut until he has assured himself that the iris has yielded sufficiently for the adjustment he has given the iridectome. If this is not the case he can readily let go of the iris and resort to whatever expedient is indicated by the circumstances.

The first model of the iridectome was made for me by Hunzinger of Cologne, Germany, and its present perfected form by G. Tiemann & Co., New York.

SYSTEMATIC REPORT ON THE PROGRESS OF
OPHTHALMOLOGY IN THE FIRST
QUARTER OF THE YEAR 1900.

BY DR. ST. BERNHEIMER, IN VIENNA ; DR. O. BRECHT,
PROF. R. GREEFF, PROF. C. HORSTMANN, AND DR.
R. SCHWEIGGER, IN BERLIN ;

WITH THE ASSISTANCE OF

Dr. G. ABELSDORFF, Berlin ; Prof. E. BERGER, Paris ; Dr. SWAN M. BURNETT,
Washington ; Dr. DALÉN, Stockholm ; Dr. J. HERRNHEISER, Prague ; Prof.
HIRSCHMANN, Charcow ; Dr. KRAHNSTÖVER, Rome ; Mr. C. D.
MARSHALL, London ; Dr. P. VON MITTELSTÄDT, Metz ; Prof.
DA GAMA PINTO, Lisbon ; Dr. C. H. A. WESTHOFF, Am-
sterdam ; and others.

Translated by Dr. WARD A. HOLDEN.

Sections IV.-VII. Reviewed by DR. ABELSDORFF, Berlin.

IV.—ANATOMY.

59. v. HIPPEL. Are medullated fibres of the retina a congenital anomaly? *Graefe's Archiv*, xlix., 3, p. 591.

60. PICK. Black optic nerves. *Arch. f. Augenheilk.*, xli., p.

96. (In a patient with medullated optic-nerve fibres there was an accumulation of pigment on the disc, most intense at the place of the physiological excavation.)

61. TERESCHKOWITSCH. On coloboma of the optic nerve. *Arch. f. Augenheilk.*, xli., p. 100. (A combination of medullated fibres with coloboma of the optic nerve.)

62. CASPAR. On the occurrence of isolated spots of medullated nerve fibres in the retina. *Arch. f. Augenheilk.*, xli., p. 195. (Four cases without the presence of analogous formations at the margin of the disc.)

63. SCHOUTE. Trunks of venæ vorticosæ near the optic nerve. *Zeitschr. f. Augenheilk.*, iii., p. 228.

64. PICHLER. On the decussation of the optic nerves in man. *Zeitschr. f. Heilkunde*, xxi., 1, 1900.

65. SCHIRMANSKY. Three cases of congenital coloboma of the choroid. *Wjest. Ophth.*, 1899, No. 6.

66. SCHULTZE. Microscopic anatomy of the lens and zonula. *Graefe-Saemisch Handbuch*, second edition.

67. GREEFF. Microscopic anatomy of the optic nerve and retina. *Ibid.*

v. HIPPEL (59) believes that medullated fibres in the retina are congenital only in the sense of a disposition to this anomaly. They have never been seen in the new-born, the optic nerve being the last of the cerebral nerves to become medullated. In the rabbit the beginning of the normal medullation of the fibres at the sides of the disc can be observed when the eyes open on the tenth day.

SCHOUTE (63) describes four cases in which trunks of the venæ vorticosæ could be followed up to the neighborhood of the disc, their points of exit not being, as usual, near the equator of the eye.

PICHLER (64) examined the chiasm of a patient who died three weeks after the enucleation of a seeing eye.

The Marchi and Algeri methods were used and the chiasm cut in horizontal sections.

His conclusions are as follows :

1. There is a semi-decussation in the human chiasm.
2. In the chiasm and tracts the crossed and uncrossed fibres are not sharply separated, but mixed in various proportions.
3. The uncrossed fibres run in the lateral and dorso-lateral portions of the chiasm. In the tract they lie in the dorsal two thirds, close together in a ribbon-like zone between the upper and lower surfaces.
4. The crossed fibres occupy the middle portions of the chiasm.
5. These fibres run almost in a frontal plane from one half of the chiasm to the other, passing from the dorsal to the ventral surface. They collect at the floor of the chiasm, to either side of the median plane, into bundles running sagittally which enter the tracts.
6. A portion of the fibres, before entering the tract, pass in a short loop into the nerve of the other side.
7. These loops are present only in the ventral segment.

8. In the tract the crossed fibres lie mostly at the base and in their course backward remain in the ventral segment.

A small number of crossed fibres, mingled with the uncrossed, are distributed over the entire cross-section of the tract.

These results accord fully with those reached by Dimmer, who employed the same method on frontal sections of the human chiasm, and therefore disprove the view that the results obtained with Marchi's method are unreliable. HERRNHEISER.

SCHULTZE (66) gives a clear and comprehensive account of the microscopic anatomy of the lens and zonula. He regards the zonula as of epiblastic origin.

The first portion of GREEFF's (67) description of the microscopic anatomy of the optic nerve and retina is now published. After a general résumé, based on the neuron idea, he describes the nerve and its sheaths. The article has been thoroughly worked over, a description of the neuroglia and a discussion of Fuchs's peripheric atrophy having been introduced.

V.—PHYSIOLOGY.

68. BRUDZEWSKI. A contribution to the dioptrics of the eye. *Arch. f. Augenheilk.*, xl., p. 296.

69. REIMAR. On parallaxic and perspective displacement in estimating differences of level in the eye. *Ibid.*, xli., p. 163.

70. LANS. On the width of the pupil. *Arch. f. Anat. u. Physiol. Phys. Abth.*, 1900, p. 79.

71. ABELSDORFF. The changes in the width of the pupil due to differences in the color of the illumination. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, xxii., p. 81.

72. SACHS. On the effect of colored light on the width of the pupil. *Ibid.*, p. 241.

73. URIBE-TROUCOSO. Theories of accommodation. Explanation of the accommodative descent of the lens. *Ann. d'ocul.*, xxiii., p. 161.

74. BICKERTON. Remarks on the Holmgren wool test: is it adequate for the detection of color-blindness? *Brit. Med. Journ.*, March 17, 1900.

75. WEILAND. Some disputed points about the entoptic observation of the circulation in the retinal capillaries. *Ophth. Record*, Feb., 1900.

BRUDZEWSKI (68) determined by means of a modification of the Javal-Schiötz ophthalmometer the refractive value of the cornea in the centre and in the periphery. He found that the cornea has not the shape of a regular figure of rotation ; the spherical aberration may be positive in the zones near the visual line (the periphery more highly refractive than the axis), and negative in the periphery of the pupillary region.

Since the total spherical aberration of the unaccommodated eye is never higher than that of the cornea, and is sometimes less, the lens must have a weak negative aberration.

REIMAR (69) calls attention to the fact that besides the paralactic displacement in the inverted image the apparent movement in perspective displacement in the upright image is of diagnostic value since it permits very slight differences in relief to be recognized.

LANS (70) in the physiological laboratory at Utrecht has studied the reaction of the pupil under an illumination of 1-1000-metre candles and with maximum adaptation. Accommodation, convergence, and psychical and sensory excitations were excluded.

With a light intensity of 0-25-metre candles the size of the pupil was determined by snap-shot photographs taken within the period of the pupillary reflex before a reflex closure of the lids occurred. After a quarter of an hour's adaptation the horizontal diameter of L.'s (aged twenty-nine) pupil, in absolute darkness, was 7.8 mm. With an illumination between 0- and 25-metre candles this decreased, at first rapidly and then more slowly.

Between 25- and 900-metre candles the average vertical diameter of the pupil in eleven persons between eighteen and thirty years of age decreased rapidly at first and then more slowly when the eye was illuminated.

The contraction of the pupil is simultaneous with the increase in acuteness of vision.

ABELSDORFF (71) made experiments with lights of the spectral colors and found that with adaptation for light, yellow causes more contraction of the pupil than the other colors. With adaptation for darkness blue causes a greater contraction.

SACHS (72) states that Abelsdorff's results confirm the results of his experiments on this subject in which colored pigments were used.

BICKERTON (74) cites the case of a naval officer who had mistaken the green light of an approaching vessel for a white one, though he

had successfully passed the tests required by the Board of Trade. He was again examined and stood the Holmgren wool test, though with the spectrum and other tests he exhibited a slight defect of red sensation. He matched an orange mixture with a pure yellow and called a true yellow match "too green." Bickerton believes that the Holmgren wool test is not a certain discoverer of the lesser marked forms of color-blindness and that a quantitative test for color should in addition be required.

ARNOLD KNAPP.

WEILAND (75) has convinced himself from experimentation that Helmholtz's idea in regard to the "flying flies" in the field of vision as seen through cobalt blue glass, on an even illuminated surface, as due, not to the shadow or reflexes of the blood corpuscles, but to a temporary stoppage in the circulation in the retinal capillaries, is the correct one.

BURNETT.

VI.—REFRACTION AND ACCOMMODATION.

76. PFALZ. On perverse astigmatism—an acquired error of refraction. *Zeitschr. f. Augenheilk.*, iii., p. 16.

77. JAVAL. The etiological conditions of myopia. *Bull. de l'Acad. de Méd.*, Paris, Jan. 9, 1900.

78. DRUAULT. Astigmatism of the rays entering the eye obliquely. Application of skiascopy. *Arch. d'opht.*, xx., p. 21.

79. DEMICHERI. Treatment of myopia by removing the lens. The index of refraction of the lens. *Anales de oftalm.*, ii., No. 6.

80. BOTWINNIK. A contribution to the question of myopia in Israelites. *Wratsch*, 1899, No. 42.

81. IGNATIEFF. A case of myopia of high degree and its relations to the question of the etiology of myopia. *Wojenno med. Journ.*, 1900.

82. BYLSONA. On paresis of accommodation from diphtheria. *Med. Weekblad*, vi., 1900, No. 49.

83. BULL, C. S. The operative treatment of myopia of high degree by the removal of the crystalline lens. *Med. News*, Jan. 20, 1900.

84. STEVENS, E. W. Facial spasm and its relation to errors of refraction. *Amer. Journ. Med. Sciences*, Jan., 1900.

PFALZ (76) found that the total astigmatism against the rule steadily increases from 0 in the first decade of life to 27.9 per

cent. in the seventh decade. From this it follows that astigmatism against the rule appears with increasing growth of the body. According to Pfalz's measurements there is a decrease of corneal refraction, particularly in the vertical meridian, as the person grows older.

As to the proportion of the total astigmatism against the rule to the corneal refraction, there was in the second and third decades for the most part also corneal astigmatism against the rule. From the fourth to the sixth decade the proportion of cases of total astigmatism without asymmetry of the cornea increased, and only after the sixtieth year did the latter furnish the chief portion of the astigmatism.

BOTWINNIK'S (80) statistics obtained from various sources lead him to the following conclusions: (1). Myopia is four or five times more frequent in Hebrews than in Christians, and more frequent in men than in women. (2). Hyperopia is less frequent than in Christians. (3). Myopia above 10 D is much more frequent in Hebrews than in Christians and more frequent in women than in men. (4). The average degree of myopia is higher in Hebrews than in Christians. (5). Myopia develops earlier in life in Hebrews. (6). Diminished acuteness of vision with myopia is much more frequent in Hebrews. (7). Choroidal and macular complications are more frequent. (8). Heredity disposition plays a greater rôle in the Hebrew, hence (9), the Hebrew must contend more against the development of myopia.

HIRSCHMANN.

BULL (83) in a long paper considers what has been written on the subject of lens extraction in high myopia. The contraindications are serious disease of any kind in the interior of the eye, a contagious conjunctivitis, and advanced age of the patient. He never operates under 12 D of M. If the central vision is not with correction sufficient for the social needs of the patient, and if there is a marked tendency to increase of the M, he considers the operation justifiable.

BURNETT.

STEVENS (84) has had a number of cases of "facial spasm" in which he found a correction of the refractive error has had a decided influence. He thinks that in all cases of facial spasm the refractive error and muscular unbalance should be corrected.

BURNETT.

VII.—MUSCLES AND NERVES.

85. v. BECHTEREFF. On pupil-contracting and pupil-dilating centres in the posterior portions of the cerebral cortex in monkeys. *Arch. f. anat. u. Physiol. Physiol. Abth.*, 1900, p. 25.

86. GUILLERY. The effect of poisons on the fusion movements of the eyes. *Arch. f. d. gesamt. Physiologie*, lxxiv., p. 597.

87. BERNHEIMER. The regions of the roots of the eye nerves, their communications, and their connection with the cerebral cortex. *Graefe-Saemisch Handbuch*, 1900.

88. ANTAL. On the Westphal-Piltz so-called paradoxical pupillary phenomenon. *Neurol. Centralbl.*, 1900, p. 149.

89. UHTHOFF. Isolated paralysis of right and left lateral version of the eyes. Paralysis of divergence. *Allgem. Medicin. Central-Zeitung*, 1900, No. 15, p. 175.

90. MARGULIES. On the so-called Bell phenomenon in central paralysis of the facial nerve. *Wien. med. Wochenschr.*, 1900, Nos. 5 and 6.

91. BREGMAN. The reaction of degeneration in the levator and remarks on an isolated traumatic paresis of the oculomotorius and trochlearis nerves. *Kronika Lekarska*, 1900, No. 4.

92. MIKLACZEWSKI. On mydriasis saltans seu alternans. *Ibid.*, 1900, 1-2.

93. PLANTENGA. A case of recurrent oculomotor paralysis. *Ned. Oogh. Bydr.*, 1900, No. 9.

94. SCHOUTE. A contribution to the knowledge of torsion movements. *Ibid.*

95. MARLOW. A case of incomplete ophthalmoplegia externa. *Ophth. Record*, 1900, p. 6.

v. BECHTEREFF (85) found in the posterior portions of the cerebral cortex two pairs of centres which, being electrically stimulated, caused dilatation and contraction of the pupils with associated movements of the eyeballs. One centre lies near the anterior margin of the occipital lobe, the other in the parietal lobe. Bechtereff believes that the former pair may possibly be concerned in bringing about Haab's cortical reflex, and the latter the attention reflex of Piltz.

GUILLERY (86), continuing his studies on the effect of poisons on the mobility of the eyes (*Pflueger's Arch. f. d. ges. Physiol.*, 77), has investigated the action of poisons on the torsion movements.

A stereoscopic method was employed in which double images were produced. The experiments were done on the author himself after taking alcohol, morphine, chloral hydrate, trional, sulfonal, ether, and chloroform. It was found that the ability to perform torsion movements was reduced to a greater or less degree by all the poisons except morphine.

BERNHEIMER'S (87) chapter is one that was not present in the first edition of Graefe-Saemisch, and is a welcome résumé of the subject which has been worked up for the most part within the last decades.

The author, who has taken such an important part in the investigation of this difficult subject on the boundary line of ophthalmology, traces the course of the bundles of optic-nerve fibres, proving the semi-decussation in the chiasm, and then takes up the oculomotorius, trochlearis, and abducens, and, in so far as they concern the eye, the facialis, sympathicus, and trigeminus. In the second section the communications of the roots of the ocular nerves are described, and in the third section their connections with the cortex.

According to ANTAL (88) the so-called paradoxical pupillary reaction is caused when the lids are energetically pinched together (Westphal) or are held apart while the patient is urged to close them and then to cease (Piltz). On ceasing the effort the pupils contract and then dilate. This is a physiological process. If contraction does not follow the dilatation there is usually some nervous disease, when the test is made in Westphal's manner.

For obtaining the reaction in general Piltz's procedure is more reliable. The paradoxical pupillary phenomenon is found as a prodromal symptom while light reaction still remains, and also as a late symptom when the pupils no longer react to light or in accommodation.

UHTHOFF (89) presented a woman of twenty-six in whom both external and internal recti were paralyzed, only the left internus still having slight mobility. Her general condition was disturbed, and the symptoms indicated a lesion of the pons and the nuclear region of the abducens. In another woman of thirty-seven a paralysis of divergence was the only discoverable symptom.

MARGULIES (90) found that in three cases of central paralysis of the facial nerve Bell's phenomenon (upward turning of the eyeball when the lids are closed) was not present, while in cases of peripheral paralysis the symptom is readily observed. Although

these observations are not sufficiently numerous for a conclusive decision, nevertheless they indicate that Bell's phenomenon is an associated movement arising from the cerebrum, connected with the intact and functionally active will-path for the closure of the eye, since it disappears when this path is interrupted and returns when the path is restored.

SCHOUTE (94) measured the torsion movements of the eye with the apparatus devised by Prof. Mulder. He came to the conclusion that the torsion movements with inclination of the head are parallel to a fraction of a degree. He reports also on a symmetrical torsion movement which is constantly found when the head is turned to the right or the left. The upper halves of the meridians then incline toward the temples, just as in looking upward.

K. JIDA.

MARLOW (95) records the case of a woman of thirty-three who had restricted movements of the eyes in all directions. R, up 25° , down 40° , out 35° , in 30° . L, up 25° , down 38° , out 12° , in 12° . There was orthophoria in the central position. He regards it as congenital. There was no ptosis.

BURNETT.

Sections VIII.—XII. Reviewed by DR. R. SCHWEIGGER, Berlin.

VIII.—LIDS.

96. THOINOT and GIROT. Malignant œdema of the lids. *Progrès Méd.*, 1900, No. 3.

97. PRAUN and PRÖSCHER. Malignant pustule of the upper lids and brows. *Centralbl. f. Augenheilk.*, Feb., 1900, p. 41.

98. PLAUTH. Gangrene of the lid from the excessive use of ice. *Klin. Monatsbl. f. Augenheilk.*, 1900, p. 35.

99. STRERATH. A contribution to the subject of vaccine blepharitis. *Inaug. Dissert.*, Giessen, 1900.

100. DULTZ. Trichiasis operations. *Inaug. Dissert.*, Königsberg, 1899.

101. DIANOUX. The treatment of congenital ptosis by Motais's procedure. *Ann. d'ocul.*, March, 1900, cxxii., p. 171.

102. NATHANSON. On the structure of cornu cutaneum. *Wratsch*, 1899, No. 43.

THOINOT (96) reports a case of malignant pustule of both lids, following the bite of an insect at the outer commissure. Under treatment with sublimate compresses there was recovery, but with

partial destruction of the upper lid, so that a plastic operation was required later. A bacteriological verification of the diagnosis was not obtained, but it was found that several animals of which the patient had charge had suffered from malignant pustule.

BERGER.

PRAUN and PRÖSCHER (97) saw two cases of malignant pustule of the lids. The pustules varied in size from that of a pea to that of a half-dollar; some suppurated, others were bluish-red and when incised evacuated a gangrenous mass, after which healing occurred. The diagnosis could only be made by means of cultures.

PLAETH (98) states that the expression "gangrene of the lid" is used not only for cases of destruction of tissue, with an offensive odor, but also for every necrosis to which the lid is disposed. Plaeth's patient applied an ice-bag to the lids for twenty-four hours. The lid lost its covering epidermis by ulceration, but this was finally restored.

STRERATH (99) describes a case of vaccine blepharitis, coming on three days after vaccination of a child's arm. There were some pustules, a phlegmonous swelling of the lids, slight conjunctivitis, and intact cornea. A second case occurred in a woman of fifty-three, who had a blepharitis and then had been infected by a grandchild. The skin above the lid margin assumed a diphtheritic appearance, the conjunctiva became grayish yellow and chemotic, and furnished quantities of thin, purulent secretion, and the cornea became cloudy, but cleared up except for a small macula. The therapy must be mild: cleanliness and two-per-cent. boric acid.

DIANOUX (101) reports a case of congenital ptosis, in which Motais's operation for raising the upper lid by attaching a tongue-shaped flap of the tendon of the superior rectus to the lid gave a very good result.

BERGER.

IX.—LACHRYMAL APPARATUS.

103. TERSON. Dacryoadenitis of blennorrhagic origin. *Bull. de la Société d'ophtal. de Paris*, March 5, 1900.

104. ROGMAN. On the tumors of the lachrymal gland. *Ann. d'ocul.*, Feb., 1900, cxxiii., p. 81.

105. VEILLON and MORAX. Gangrenous pericystitis. *Ibid.*, March, p. 175.

106. TRUC. Some grave lachrymal complications, orbital phlegmon, optic atrophy, panophthalmitis, meningitis. *Ibid.*, Feb., 1900, p. 94.

107. GUNN, DONALD. Lachrymal obstruction in the young. *Ophth. Review*, Feb., 1900.

108. HAWLEY. Mucocoele in the new-born. *Four. Amer. Med. Assoc.*, Feb. 17, 1900.

TERSON (103) reports a case of metastatic dacryoadenitis in a woman of thirty-eight with a urethral blennorrhœa. She recovered after using inunction treatment for a month. Only three similar cases have been reported previously, those of Seeligsohn, Panas, and Terson.

ROGMAN (104) reports a case of tumor of the lachrymal gland, which, on microscopic examination, showed the characteristics of an endothelioma springing from the ducts of the gland.

BERGER.

VEILLON and MORAX (105) describe a case of acute phlegmonous dacryocystitis with the formation of a fistula in which the pus had a most fœtid odor. The skin over the lachrymal sac was infiltrated and of violet color. A portion of the infiltrated tissue was cast off. Bacteriological examination revealed the presence of the streptococcus pyogenes and two anaerobic micro-organisms, one corresponding to the bacillus funduliformis (Veillon and Zuber, Halle), the other an undescribed coccobacillus. The gangrenous process is, according to Veillon and Morax, due to the simultaneous presence of the streptococcus and the other two micro-organisms, the fœtid odor not being present in diseases of the lachrymal passages caused by the streptococcus alone. An antiseptic treatment with cyanide of mercury and sounds led to a complete cure.

BERGER.

From TRUC's (106) important paper it appears that a chronic dacryocystitis or a phlegmon of the region of the sac may lead to severe septic affections of the eye. He reports an interesting case and gives a résumé of those previously published. In two cases of dacryocystitis orbital phlegmon developed with optic neuritis and atrophy, in one case following curettage of the sac. Cases of orbital abscess after the introduction of sounds (Valude) and injections (de Wecker) have been observed to end in optic-nerve atrophy. In one case (Leplat) death occurred from meningitis. In a case of purulent dacryocystitis in a woman suffering from diabetes Truc saw panophthalmitis leading to blindness in

both eyes. The diabetes had doubtless favored the development of the panophthalmitis, still there was unquestionably metastatic ophthalmia, caused by the local focus of infection in the sac.

BERGER.

According to GUNN (107) lachrymal troubles are most frequent in adults past middle age and in young children. In the first group a cause usually cannot be found; in the latter, on the contrary, this is the exception. The primary cause in children is an obstruction at the lower part of the duct caused by some developmental fault. The cases in children appear early or late. The early group contains cases of obstruction with a dilated nasal duct or cases generally associated with conjunctivitis but no evidence of a dilated duct. The late group includes cases of syphilitic children or where there is a tuberculous disease of the bones of the nose or orbit. Cases are described illustrating each of these varieties.

ARNOLD KNAPP.

HAWLEY (108) has seen six cases of mucocele in the new-born. The indications are to establish drainage into the eye if it is not possible to get it into the nose. For this purpose he makes a small opening on the external surface of the tumor under an anæsthetic. Probing is sometimes necessary.

BURNETT.

X.—ORBIT AND NEIGHBORING CAVITIES.

109. LAGRANGE. Encysted hydrops of the bursa of Tenon. *Bull. de la Soc. d'opht. de Paris*, Feb. 6, 1900.

110. VERNEUIL. Osteitis of the summit of the orbital cavity. Phlebitis and thrombosis of the ophthalmic vein and of the cavernous sinus. Phlegmon of the orbit. Death. *Ann. de la Soc. Belge de Chirurg.*, 1900, No. 2.

111. DIANOUX. Hyperostosis of the orbit. *Bull. de l'Acad. de Méd.*, Paris, March 20, 1900.

112. SCHOELER, FRIEDRICH. Four cases of orbital injury. *Inaug. Dissert.*, Berlin, 1900.

113. WAGENMANN. Echinococcus of the orbit in a boy of six. *Deutsche med. Wochenschrift*, 1900, No. 15.

114. SCHLODTMANN. On the extirpation of retrobulbar tumors with preservation of the eyeball, and the clinical condition of the eye after the operation. *Festschr. f. A. v. Hippel*, Halle, 1900.

115. GOLOWIN. Two cases of pulsating exophthalmus successfully operated upon. *Chirurgia*, Oct., 1899. From an abstract in *Wratsch*, 1899, No. 51.

116. WINKLER. On the treatment of suppuration of the frontal sinus. *Münch. med. Wochenschr.*, 1900, No. 3, p. 77.

117. WEINHOLD. A case of cystic dilatation of an ethmoid cell. *Klin. Monatsbl. f. Augenheilk.*, Jan., 1900, xxxviii., p. 30.

118. OLIVER. A case of traumatic varix of the orbit in which ligation of the left common carotid was successfully performed. *Amer. Journ. Med. Sciences*, March, 1900.

119. GUTTMANN. Retrobulbar abscess due to empyæma of the maxillary antrum and ethmoidal sinus resulting from dental caries. Operation; recovery. *Annals of Ophth.*, Jan. 7, 1900.

120. MURRAY. An unusual case of orbital gonorrhœa, infection following irritation from an artificial eye—complicated by septic endocarditis. Death and autopsy. *Ophth. Record*, Feb., 1900.

121. BELLOWS. A case of fracture of the orbit with unusual symptoms. *Ophth. Record*, March, 1900.

In a case in which LAGRANGE (109) had diagnosed tumor of the optic nerve and intended to extirpate it with preservation of the ball, it was found during the operation that there was a collection of liquid in the encysted posterior portion of Tenon's capsule. The appearance of tumor of the optic nerve vanished after the escape of the liquid, and vision rose from $\frac{1}{25}$ to $\frac{1}{10}$. A similar case was reported by Caron de Villards in the *Annales d'oculistique* for 1858.

BERGER.

DIANOUX (111) reported on a case of exostosis of the inner wall of the orbit in a girl of nineteen which had caused exophthalmus and diminution of vision. There were no symptoms of syphilis. With the help of the Roentgen rays the position and extent of the exostosis was determined and it was chiselled off. After the operation the eye resumed its normal position and the acuteness of vision became normal.

To his own observation SCHOELER (112) adds the reported cases of orbital injury which are sometimes followed by amaurosis. The complete blindness usually passes off in from three to fourteen days, but the vision remains poor, and there are defects in the field, and reduced color perception. In such cases there is either direct injury of the optic nerve by a foreign body or compression by splintering of the orbit or by hemorrhage.

IN WAGENMANN'S (113) case a cyst was removed by operation, and microscopic examination proved it to contain a dead echinococcus in process of absorption. The process is characterized by marked inflammation of pronouncedly purulent character and is due to the phlogogenic action of the entozoon.

SCHLODTMANN (114) discusses the appearance of the retinal blood-vessels after division of the optic nerve. Sometimes the vessels are empty, sometimes moderately large, or even of normal calibre. Vessels small at first may become large afterwards, this indicating intrascleral anastomoses, since at the ora serrata there are none. The retina does not regularly become pigmented, and this is perhaps only dependent upon destruction of the anterior ciliary arteries, as from rupture of the muscles. As regards the final cosmetic effect and the position and mobility of the eye, the results are better after Knapp's operation than after Krönlein's. The latter should never be used for purely diagnostic purposes; it however offers easier access to deep-seated tumors.

IN GOLOWIN'S (115) first patient, a woman of nineteen, the lids were swollen and there was slight ptosis. On the upper lids near the inner commissure, on the sides of the nose, and on the cheeks were several round, bluish, compressible nodules, pulsating synchronously with the pulse. The fatty tissue of the orbit was wanting, but the fundus, acuteness of vision, and ocular movements were normal. On palpation of the eyes pulsation could be felt in the orbit. The veins in the palpebral conjunctiva were much dilated. The first changes in the eyes were noticed thirteen years before.

Trauma was denied. The author made an incision from the bridge of the nose above the upper margin of the orbit, exposed the dilated veins, and after ligating removed them. This operation was done on the other eye six weeks later. The course of healing was favorable. All the dilatations disappeared. The author thought that the communications between the artery and the vein in the cavernous sinus had arisen from menstrual retention.

2. A woman of thirty-one. The lids of the right eye swollen, the veins of the skin dilated, the ball displaced forward and outward. Pulsation synchronous with the arterial pulse. Cornea, conjunctiva, and right half of the face anæsthetic. Cornea cloudy in the centre. Disc pale. V=0. Paresis of the motor branch of the fifth nerve. Left eye normal. These changes were due to a

revolver shot in the right temple. The ball was discovered in the maxillary bone by means of the Roentgen rays. The outer wall of the orbit was resected according to Krönlein's method, the dilated pulsating vein was tied, and the bone flap returned to place. There was partial suppuration of the orbit. The exophthalmus disappeared.

HIRSCHMANN.

WINKLER (116) states that in operations on the frontal sinus, the ethmoid must be avoided carefully. The anatomical connections between the two sinuses and the size of the frontal sinus often show in operations great variability.

Jansen's method should not be used in cases in which the orbital contents are not disturbed.

Kuhnt's method by breaking down the anterior wall is indicated only in

1. Disease of the anterior wall of the sinus (fistula, necrosis, etc.).
2. Rhinogenous cerebral disease or suspicion of empyæma breaking through the posterior wall.
3. A multicellular frontal sinus.
4. A small frontal sinus and uncomplicated suppuration of the frontal sinus.

Otherwise, since the defects caused are so disfiguring, the osteoplastic methods of Czerny and Küster are preferable. Obliteration of the frontal sinus is not always necessary, it often being sufficient to clear out the sinus and furnish it with an exit.

In WEINHOLD'S (117) case of dilatation of the ethmoid there was only at the inner angle of the eye, projecting into the orbit, an oval tumor as large as a bean, without certain fluctuation, and no other symptoms upon which to base a diagnosis. When opened a cavity lined with mucous membrane was found, which contained a cloudy liquid and had pressed through the lachrymal bone into the orbit and was limited laterally by the displaced lamina papyracea of the ethmoid. There was no communication with the nose. The lamina and the mucosa were removed. The author considers it probable that it was a case of old hydrops of one or several ethmoid cells which had been cut off and distended by the increasing contents.

OLIVER'S (118) patient was a man of twenty-seven years who had had a crush of the head, some years before and quite recently a blow on the left side of the head, after which the eye symptoms appeared. There were an exophthalmus and almost complete fixity

in the orbit, with enlargement of the conjunctiva from congestion. Retinal veins much swollen, pupil inactive to light or consensually. No bruit in orbit, but on temporal region. The left common carotid was ligated with a complete subsidence of these symptoms after a time, but the eye was lost through a glaucomatous attack.

BURNETT.

The patient whose history is recorded by GUTTMANN (119) was five years old and complained of slight toothache. This was followed by symptoms which are characteristic of abscess of the antrum and implication of the orbital contents. Pus was liberated by incising the lids, and after the tooth was extracted the antrum was pierced and drained. The ethmoid was also found to be diseased and was curetted and drained. A final recovery was the result.

BURNETT.

In MURRAY'S (120) case the infection of the conjunctiva came from an artificial eye. There was a urethral gonorrhœa. Soon after symptoms of endocarditis set in and the patient died therefrom. The autopsy confirmed the diagnosis.

BURNETT.

In BELLOWS'S (121) case, after a severe injury to the orbit, resulting in a paralysis of the inferior rectus of left eye with ecchymosis of the conjunctiva, there was manifest a monocular vertical diplopia in that eye. At twenty feet the candles were separated about two inches. This symptom gradually wore off.

BURNETT.

XI.—CONJUNCTIVA.

122. KESSLER. Conjunctivitis of animal origin. *Ned. Oogh. Bijdr.*, 1900, No. 9.

123. SCHANZ. On the diphtheritic inflammations of the conjunctiva. *Zeitschr. f. Augenheilk.*, iii., 3, p. 193.

124. v. AMMON. On the diagnosis and therapy of ophthalmia neonatorum. *Münch. med. Wochenschr.*, 1900, No. 1.

125. LAMHOFER. On the treatment of ophthalmia neonatorum. *Ibid.*, No. 8.

126. ADDARIO. Anatomical and bacteriological investigations on trachoma. *Arch. f. Augenheilk.*, xli., 1, p. 20.

127. ADLER, HANS. New methods of treating trachoma. *Wiener med. Presse*, 1900, No. 7.

128. VIEUSSE. A contribution to the study of tuberculosis of the conjunctiva. *Rec. a'opht.*, Jan., 1900, p. 1.

129. KUHN. Extensive tuberculosis of the conjunctiva and cornea cured by an attack of facial erysipelas. *Zeitschr. f. Augenheilk.*, iii., 3, p. 146.

130. FRANKE. Pemphigus and essential shrinking of the conjunctiva. Bergmann, Wiesbaden, 1900.

131. STRZEMINSKI. A case of glanders of the palpebral conjunctiva cured by the galvano-cautery. *Rec. d'opht.*, 1900, 1, p. 8.

132. STEPHENSON, SYDNEY. Diphtheria of the conjunctiva. *Lancet*, Feb. 17, 1900.

133. SHOEMAKER and ALT. A case of almost symmetrical papilloma-like tumors of the conjunctiva of both eyes. *Am. Jour. of Ophth.*, March, 1900.

134. MORTON. A brief clinical study of conjunctival ulceration. *Ophth. Record*, March, 1900.

KESSLER (122) describes a case of acute conjunctivitis with marked thickening of the conjunctiva, associated with swelling of the glands, fever, and œdema of the pharynx and glottis. These symptoms accorded with those which Parinaud has described as infectious conjunctivitis of animal origin. The disease, according to the author, was acquired from a horse suffering from staggers, and is to be regarded as an infection with the streptococcus equi, which causes this disease in horses. JIDA.

SCHANZ (123) maintains that Neisser's method of staining the granules does not make it possible to distinguish true, virulent diphtheria bacilli from the pseudo-diphtheria bacilli. He agrees with the view that innocent diphtheria bacilli may, on a proper culture medium, become malignant, and believes that this may happen in fibrinous membranes developing on the conjunctiva from other causes. The present classification of conjunctival diseases according to their clinical features should not be supplanted by a new classification from an etiological standpoint.

LAMHOFFER (125), like von Ammon, has treated blennorrhœa of the new-born and of adults without medicaments. He has the conjunctival sac washed out every hour with an undine, and corneal complications have never appeared except in weakly infants in whom keratomalacia developed. The use of pencils and other instruments is likely to accomplish nothing more than injury to the cornea.

According to ADDARIO (126) both the new and the old trachoma granules exhibit a faintly stained interior with large cells

and a darkly stained marginal zone with small cells. The lighter portion is well outlined and is composed of large, closely packed cells. Among the dark cells one can distinguish clearly a loose connective-tissue framework which can be followed also into the centre of the granule. The trachoma granule has nothing in common with the tubercle, but corresponds to the lymph nodules which may develop in any mucous membrane. Both these formations have capillary blood-vessels, while the lymph cells are not found in lymphatic capillaries but in cleft-shaped spaces. Over the larger granules the conjunctival epithelium is altered and flattened. Besides the granules there may be a papillary proliferation as in chronic blennorrhœa. The granules flatten and evacuate their contents more or less completely, almost never with suppuration; or they undergo a partial necrosis and are absorbed. In every case, however, they cause a new formation of connective tissue in their neighborhood, which leads to a cicatrix in the adenoid layer of the conjunctiva. Bacteriologically the author came upon a new sort of bacillus arranged in threads, which he believes to be a variety of the xerosis bacillus.

ADLER (127) finds that all medicaments are of some value in the treatment of trachoma. The rubbing in of sublimate is of value only in follicular catarrh. Electrolysis and the galvano-cautery are of service in some cases. Grattage injures the membrane too much. Expression of the granules may be done with the finger-nails or better with Knapp's roller forceps or Kuhnt's expressor.

VIEUSSE (128) reports on three cases of tuberculous disease of the conjunctiva which appeared in two cases in the form of an ulcer and in one case in that of granulations. Recovery after the use of the galvano-cautery. As regards the development of conjunctival tuberculosis the author believes with Audry that like lupus of the face it arises from tuberculous ulcers of the nasal mucosa.

KUHNT (129) describes a case of spontaneous recovery from extensive tuberculosis of the conjunctiva and cornea after an attack of erysipelas of the face. The ulcerated preauricular, sublingual, and submaxillary glands cicatrized at the same time. For months the tuberculosis had resisted all forms of treatment. Similar processes occur; besides the relation of erysipelas to malignant tumors, there is an antagonism between the erysipelas streptococcus and the bacillus of splenic fever.

FRANKE (130) has collected the literature of the subject and distinguishes an acute affection with the formation of vesicles on the skin and conjunctiva, a similar chronic affection, and a conjunctival affection of similar character without any affection of the skin. Of the first category only a few cases have been seen. They recover in 2-3 weeks. The third category is the most interesting. Here the mucosa of the nose and mouth may be affected like the conjunctiva. The characteristic feature of the affection is the final shrinking of the conjunctival sac and the partial adhesion of the margins of the lids. The etiology mostly cannot be made out. Pemphigus of the skin is rarely present. It is better to use Graefe's designation, "essential shrinking of the conjunctiva," or the author's "shrinking of the conjunctiva with the formation of vesicles." As regards therapy, even transplantations into the conjunctival sac are useless, since finally they shrink and disappear.

In a veterinary surgeon of thirty-six STRZEMINSKI (131) observed a glanders nodule as large as a pea in the conjunctiva of the lower lid. It was successfully treated by excision. Bacteriological examination revealed the presence of characteristic glanders bacilli. In the cases hitherto reported the original seat of the affection has sometimes been the nasal mucosa and in several there have been metastatic abscesses of the orbit. BERGER.

Croupous conjunctivitis, according to STEPHENSON (132), has the same relation to diphtheritic conjunctivitis that rhinitis fibrinosa has to nasal diphtheria. A culture should be made in every case of membrane on the conjunctiva. Stephenson's practice is to inject antitoxin immediately, if the case is suspicious, even before the result of the culture is ascertained. The term croupous should be given up and the cases divided into mild and severe. The treatment consists of a fifteen per cent. solution of permanganate of potash applied daily in painting; weak antiseptic washes as cleansing agent. The report of a mild case is adjoined.

ARNOLD KNAPP.

The patient of SHOEMAKER (133) from whom the tumors, examined by ALT, were removed, was a man of forty. The vision in the right eye had been failing for a year; the left for a less time. In R there was a tumor of considerable consistency on the conjunctiva in the palpebral aperture, 7 mm in width and 2 mm in thickness, which passed entirely over the cornea. In the left a similar tumor was on the nasal side but passed only to near the

centre of the cornea like a pterygion. A portion of the tumor of the right eye was removed and examined by Alt. A careful study of the sections, illustrated by photo-micrographs, is recorded, revealing the following points of interest : The tumors plainly originated from the conjunctival or episcleral tissue and gradually grew towards the cornea, pulling the conjunctiva after them. The younger parts of the tissue contain trachoma granules. There is also manifest a degeneration of a hyaline character in the older parts. It is in these portions also that the tendency to a papillomatous structure is very pronounced, with a central vessel and thick layers of epithelial cells, which in some parts shows a character almost epitheliomatous. It seems to Alt that there was first a soft fibroma, which became infected with trachoma and later developed the papillomatous character. BURNETT.

MORTON (134) believes that ulcers of the conjunctiva are much more common than is generally supposed. By the use of fluorescein they can be readily detected, if not too superficial. He thinks they are important factors in the production of pterygium BURNETT.

XII.—CORNEA, SCLERA, ANTERIOR CHAMBER.

135. SNELLEN, Jr. On ribbon-shaped keratitis. *Nederl. Oogh. Bijdr.*, No. 9.

136. KRUKENBERG. Two cases of keratoconus. *Münch. med. Wochenschr.*, 1900, No. 5.

137. DE WECKER. Papilloma of the cornea. Methylene blue dressing. *Ophth. Klinik*, iv., 1.

138. STÖLTZING. A contribution to the etiology and therapy of episcleritis periodica fugax. *Münch. med. Wochenschr.*, 1900, No. 7.

139. UHTHOFF. A further contribution to the pathological anatomy of scleritis. *Graef's Archiv*, xliv., 3, 539.

140. ALT. Another case of epithelioma of the sclero-corneal region cured by galvano-cautery. *Amer. Jour. of Ophth.*, Feb., 1900.

SNELLEN (135) has scraped off the opaque layer of the cornea in several cases of ribbon-shaped keratitis. The opaque masses were found to consist of carbonate and phosphate of lime.

JIDA.

KRUKENBERG'S (136) patient had a keratoconus whose apex

was so thin that it expanded and retracted synchronously with the pulse. This could be followed with the ophthalmometer, and the patient recognized it from the variations in his circles of diffusion. Compression of the carotid caused all variations to cease.

STÜLTZING (138) considers episcleritis fugax, which is often preceded by neuralgia of the fifth pair and reddening of the hands, the local pain often being disproportionate to the injection, to be a vasomotor affection. Iodide of potassium alone is of benefit, and this acts quickly.

UHTHOFF'S (139) description corresponds in considerable measure to those of Schlodtmann and Friedland. The affection began as an infiltration of the anterior portion of the episclera, while the severe choroiditis appeared later. Uthoff did not find the pronounced necrotic foci seen by the other authors. Tuberculous foci were not found, nor were micro-organisms present.

ALT (140) reports an additional case of epithelioma at the corneo-scleral margin in a man of forty-seven years. A first removal with the knife was followed by a return two and a half months after excision. Destruction with the galvano-cautery has not been followed by a recurrence for at least eighteen months.

BURNETT.

Sections XIII.-XVIII. Reviewed by DR. O. BRECHT,
Berlin.

XIII.—LENS.

141. BÄHR. A contribution to the pathology and therapy of lamellar cataract. *Deutsche med. Wochenschr.*, 1900, 9, p. 144.

142. IMRE. Experiences with cataract extraction. *Ungar. Beiträge z. Augenheilk.*, ii., p. 31.

143. SCHULECK. Instruments, and particularly a capsule forceps, for the Graefe operation. *Ibid.*, p. 225.

144. WALDMANN. The operation for luxated cataracts. *Ibid.*, p. 189.

145. FEILCHENFELD. Observations on a case of injury to the lens. *Graefe's Archiv*, xlix., p. 574.

146. ALT. Notes on the microscopical conditions found in a case of so-called black cataract. *Amer. Jour. of Ophth.*, Jan., 1900.

147. ALT. On zonular cataract, with the microscopical examination of an extracted lens. *Ibid.*

148. HARLAN. Prolapse of the iris after simple cataract extraction. *Ophth. Record*, Feb., 1900.

149. FINLAY. A series of one hundred cases of cataract extractions. *Arch. f. Ophth.*, xxix., p. 54.

150. GREENWOOD. Bilateral spontaneous dislocation of the lens. *Ophth. Record*, viii., 11, p. 566.

151. BULLER. An instrument intended to facilitate the operation of capsulotomy. *Ophth. Review*, xix., p. 25.

152. POLLAK. Personal recollections of early cataract extractions. *Amer. Jour. of Ophth.*, 1900, p. 36.

In 88.75 per cent. of his cases of lamellar cataract, BÄHR (141) found rickets. He prefers discission to iridectomy.

FEILCHENFELD'S (145) case was one of iron injury, causing total aniridia and cataract.

ALT (146) found in a "black" cataract he examined after extraction not only the much-enlarged nucleus, reaching almost to the capsule, consisting of sclerosed lens fibres, but also in the deep layers of the fibres a quantity of pigment, which does not seem to come from blood, but is the remains of the destroyed pigmented epithelial cells.

BURNETT.

ALT (147) has had an opportunity of examining a lens which was affected with zonular cataract, but afterwards became generally opaque. The result of this examination is given in a series of sections with description of the conditions which is too elaborate for abstracting. The conclusion he reached, however, is that those findings favor the theory which assumes an obstacle to the original development of the lens—that is, of a really congenital origin of the condition.

BURNETT.

As a result of his experience with simple extraction, HARLAN (148) concludes that prolapse of the iris is by no means so serious as some are disposed to regard it, and that small hernias may be let alone. More extensive prolapses are to be promptly excised, if there is no danger of infection. In a few cases replacement may be possible.

BURNETT.

XIV.—IRIS.

153. GROENOUW. Anatomical investigations on serous iridocyclitis. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 186.

154. COPPEZ. Two cases of melano-sarcoma of the iris and ciliary body. *Jour. Méd. de Bruxelles*, 1900, No. 6.

155. MELLINGER. Iritis purulenta; recovery. *Thirty-fifth Annual Report of the Eye Institute at Basle*, 1899.

156. BELL, G. H. An operation for the relief of an incarcerated iris. *Med. Record*, Feb. 24, 1900.

157. COLLINS, TREACHER. Pigmented growth of the iris. *Trans. Ophth. Soc. Un. K.*, xix., p. 53.

158. GRIMSDALE. Nævus of iris. *Ibid.*, p. 61.

159. MARSHALL. Implantation cysts of the iris. *Ibid.*, p. 54.

GROENOUW (153) examined the eyes, optic nerves, and chiasm of a patient of sixty, who in life had presented the clinical picture of unirritative serous iridocyclitis. Microscopically he found a considerable round-celled infiltration of the iris, particularly in its anterior layers, and a less dense infiltration of the deeper layers of the iris, the margin of the cornea, and the ciliary body. There were accumulations of round cells on the ciliary processes and the posterior surface of the cornea, while Descemet's membrane and the epithelium were intact. Round cells and fibrillæ were found in the anterior portion of the vitreous and close to the optic disc. The choroid, retina, optic nerves, and chiasm were free from signs of inflammation, so that this case does not bear out the migration theory.

BELL (156) reduces an incarcerated iris by one sweep of a Graefe knife introduced after the manner of making sclerotomies, retaining a conjunctival flap. The forceps are then introduced, the iris excised, and the columns of the coloboma replaced and the conjunctival flap reapplied.

BURNETT.

XV.—CHOROID.

160. DESPAGNET. Ossified fibroma of the choroid. *Ann. d' ocul.*, cxii., p. 371.

161. KAMOCKI. A case of disseminated sarcoma of the choroid. *Zeitschr. f. Augenheilk.*, p. 32.

162. SCHIMANSKI. Three cases of congenital coloboma of the choroid. *Wjest. Ophth.*, xvi., 6, p. 502.

163. STIEREN. A report of two cases of metastatic choroiditis occurring in children, following measles. *Penn. Med. Jour.*, Jan., 1900.

164. DE SCHWEINITZ and STEEL. Clinical and histological study of a melanotic sarcoma of the choroid, with recurrence of the growth in the orbit five months after enucleation of the eyeball and one extrascleral mass. *Ophth. Record.*, Mar., 1900.

165. HOTZ. Profuse retrochoroidal hemorrhage after iridectomy for chronic glaucoma. *Ibid.*

166. ROWAN. Metastatic carcinoma of the choroid from a primary carcinoma of the lung. *Trans. Ophth. Soc. Un. K.*, xix., p. 103.

167. SILCOCK. Choroidal gumma. *Ibid.*, p. 69.

168. YARR. Central choroido-retinitis, resembling an optic disc, in a patient suffering from glycosuria. *Ibid.*, p. 68.

STIEREN (163) reports two cases of metastatic choroiditis, "pseudo-glioma," occurring in children who were convalescing from measles. No other cause was apparent. BURNETT.

The patient whose case is reported in full by DE SCHWEINITZ and STEEL (164), was a man aged thirty-six, who had a tumor in the eye diagnosticated five years before the time of enucleation. The eye was then in a state of acute glaucoma with a cataractous lens and adherent pupil. There was a return of the growth in the orbit five months afterward and the contents were taken out, revealing a slight invasion of the ethmoid cavity and the antrum. Some months after there was no return of the growth in the orbit. An examination of the eye showed the growth to be flat or cake-like, rather than round, and encircling the optic-nerve entrance, with infiltration at the iris angle; retina detached; a small floating nodule in the vitreous. The optic nerve was infiltrated with the non-pigmented sarcoma cells, as was also the nerve sheath. There were also pigment-bearing cells and pigment inside the vessels without an apparent lesion of the wall.

BURNETT.

HOTZ (165) has met with one of those distressing instances of profuse intraocular hemorrhage sometimes following cataract extraction, in a case of iridectomy for simple glaucoma. The patient was a woman of sixty-three years; the operation was perfectly smooth under a general anæsthetic. In about twenty hours she was seized with severe pain suddenly, and when the bandage was removed the contents of the eye was on the dressing. The eye was allowed to atrophy, not being removed. BURNETT.

XVI.—VITREOUS.

169. LAWSON. Left, vascular formation in the vitreous in a case of diabetes ; right, immature diabetic cataract. *Trans. Ophth. Soc. Un. K.*, xix., p. 268.

XVII.—GLAUCOMA.

170. MOHR. A contribution to the subject of the extirpation of the superior cervical ganglion for glaucoma. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 159.

171. STRACHOW. Two cases of glaucoma in eyes with retinitis pigmentosa. *Med. Obssr.*, Nov., 1899.

172. SACHSALBER. Complete obliteration of the retinal vessels in absolute glaucoma. *Centralbl. f. pr. Augenheilk.*, xxiv., p. 6.

173. WAGNER, W. On the clinical picture : iritis glaucomatosa. *Ibid.*, p. 44.

174. WALDMANN. The influence of iridectomy on the prognosis of glaucoma as shown in 99 cases followed for a considerable time. *Ungar. Beiträge z. Augenheilk.*, ii., p. 185.

175. TRUC and CAUVIN. Iridectomy in chronic simple glaucoma. Some late results. *Arch d'opht.*, xx., p. 1.

176. STERLING. Operative treatment of chronic glaucoma. *Journ. Amer. Med. Assoc.*, 1900, No. 7.

MOHR (170) reports on three cases of extirpation of the superior cervical ganglion in glaucoma. In the first, the effect was good at first, but a fresh attack came on ten weeks later. An iridectomy was then done, after which the eye was lost from retro-choroidal hemorrhage. In the second case, the result was good during the three months that the patient was kept under observation and the visual field gradually grew larger. In the third case, glaucomatous symptoms reappeared a week after the operation, but yielded to eserine. In all three cases, the immediate effects of the resection were narrowing of the pupil and reduction of tension to the normal. An unpleasant result in the third case was paræsthesia.

In one of STRACHOW'S (171) cases chronic glaucoma came on in one of the eyes with retinitis pigmentosa, in the second case in both eyes, only one of which had retinitis pigmentosa. The author believes that glaucoma is not rare in eyes with retinitis pigmentosa, but that it is not likely to be noticed because the

vision has already suffered from the retinitis, and any further decrease is apt to be attributed to the retinitis.

HIRSCHMANN.

WAGNER (173) describes a case of recurrent iritis with contraction of the field of vision and increased tension, in which myotics proved to be of greater value than mydriatics.

XVIII.—SYMPATHETIC OPHTHALMIA.

177. PETERS. Tuberculosis and sympathetic ophthalmia. *Zeitschr. f. Augenheilk.*, iii., 5, p. 385.

178. SOURDILLE. Sympathetic ophthalmia cured with enucleation of the injured eye. *Clin. Ophth.*, 1900, No. 22, p. 255.

179. SPICER HOLMES. Onset of sympathetic ophthalmitis two weeks after excision of the injured eye. *Trans. Ophth. Soc. Un. K.*, xix., p. 260.

180. VENNEMANN. A case of sympathetic papillo-retinitis. *Soc. Belg. d'ophth. Bull.*, 7, p. 51.

181. PFALZ. On sympathetic irritation. *Zeitschr. f. Augenheilk.*, 1900, p. 233.

182. GIFFORD. Clinical notes on sympathetic ophthalmia *Annals. of Ophth.*, Jan. 7, 1900.

183. DE SCHWEINITZ. Blindness from sympathetic ophthalmitis; restoration of vision by Critchett's operation. *Ophth. Record*, Feb., 1900.

In connection with a special case, PETERS (177) calls attention to the fact that slow bilateral iridocyclitis with the formation of nodules, presenting the picture of sympathetic ophthalmia, may be due to tuberculosis.

GIFFORD (182) gives a very careful and detailed account of three cases of sympathetic ophthalmia, caused respectively by a piece of steel entering through the cornea and lens, a traumatic inflammation from the pecking of a bird's bill, and an entanglement of the iris after cataract extraction. He considered them all typical cases except perhaps the last. The most important deductions he draws from the study of these cases are : first, there were no premonitory symptoms, such as photophobia, ciliary injection, or asthenopia ; second, the importance of examining the state of the vision daily, as this is usually the first manifestation of the disease ; thirdly, the use of larger doses of salicylate of soda in the treatment, giving as much as 150 grains a day.

Though there were no germs discovered in the two eyes that were enucleated, Gifford still clings to a germ origin of the disease. He finds the uveal tract infiltrated with leucocytes, which also often pass out of the eye along the course of the choroidal vessels, but he did not find many in the nerve itself or the sheath.

BURNETT.

In DE SCHWEINITZ'S (183) case a man of fifty-three had sympathetic ophthalmitis from injury to the fellow eye which, however, was removed. The closed pupil over a cataractous lens was enlarged by two needles, used after the manner recommended by the elder Critchett, with a very satisfactory result; vision, with correcting glasses, being $\frac{5}{25}$.

BURNETT.

Sections XIX.-XXII. Reviewed by PROF. GREEFF, Berlin.

XIX.—RETINA AND FUNCTIONAL DISTURBANCE.

184. VELHAGEN. A very rare form of retinal detachment and iridocyclitis. *Arch. f. Ophth.*, xlix., p. 599.

185. SELENSKOWSKY. On the structure and origin of retinal glioma. *Wratsch*, 1900, No. 5.

186. SIEGRIST. A contribution to the knowledge of the anatomical foundation of alcohol amblyopia. *Arch. f. Augenheilk.*, xli., p. 136

187. KOSTER. A peculiar case of congenital hemeralopia. *Ned. Tydschr. v. Geneesk.*, No. 13.

188. SANTOS FERNANDEZ. Hemeralopia treated with the physiological serum of the horse. *Rev. gén. d'opht.*, No. 2, p. 49.

189. GERHARDT. Blue-blindness with shrunken kidney. *Münch. med. Wochenschr.*, 1900, No. 1.

190. KUHN. On a peculiar change at the macula (retinitis atrophicans sive rareficans centralis). *Zeitschr. f. Augenheilk.*, iii., No. 2.

191. HOOR. A peculiar change at the macula and retinitis circinata. *Ibid.*, No. 1.

192. THOMPSON, H. WRIGHT. An unusual case of embolism in the fundus oculi. *Lancet*, Jan. 6, 1900.

193. DE SCHWEINITZ. A case of retinitis circinata. *Ophth. Record.*, Jan., 1900.

194. HOTZ. Two cases of peculiar visual perversion. *Ibid.*

195. DOWLING, FRANCIS. Tobacco amblyopia. *Journ. Amer. Med. Assoc.*

196. JENNINGS. Torpor of the retina due to exposure in the Klondike. *Amer. Journ. of Ophth.*, Jan., 1900.

197. MITCHELL. Snow-blindness. *Ophth. Record*, March, 1900.

In VELHAGEN'S (184) case there was a complete detachment of the retina including the pars ciliaris retinæ, the entire membrane being retracted into the posterior portion of the ball so that it suggested the existence of a solid tumor.

SELENSKOWSKY (185) examined the eye of a child two and a half years of age after enucleation for glioma. The tumor filled the entire space between the optic nerve and lens, and at some points had passed through the zonula into the anterior chamber. It had also invaded the posterior surface of the lens and passed 3 mm back into the optic nerve along the central vessels. The tumor consisted of the ordinary groups of cells arranged in a cylindrical manner about blood-vessels. Stained by the Golgi method the tumor was found to consist of glia cells and tissue and nerve cells of various sizes. It seemed to spring at different points from four different layers, viz., the nerve-fibre, ganglion-cell, and two nuclear layers, supporting Greeff's view that glioma develops from embryonal deposits of neuroglia and nerve cells lying dormant in any layers of the retina until particular conditions occasion the development of the tumor.

HIRSCHMANN.

SIEGRIST (186), having removed the optic nerves from a man's dead body, found microscopically a marked shrinking at the temporal sides. Microscopically there was found the well-known atrophy of the papillo-macular bundle with proliferation of the interstitial connective-tissue, indicating in the author's opinion a primary interstitial neuritis of this bundle.

KOSTER (187) describes a case of congenital circumnuclear cataract in which the color was so regular and transparent that in good illumination the patient had normal vision, but as the illumination was diminished the vision decreased considerably. After removal of the lens the hemeralopia disappeared.

SANTOS FERNANDEZ (188) calls attention to two cases previously reported by him of rapid recovery from hemeralopia after subcutaneous injections of the serum of the horse. Since both patients had also symptoms of hysteria they did not seem to

Santos Fernandez to be above suspicion. He now adds two new observations of cases uncomplicated with hysteria. Altogether three injections of 20 cc each were given, improvement following the first, and recovery occurring after four or five days.

BERGER.

GERHARDT (189) states that patients with shrunken kidney have voluntarily told him that they recognized all colors clearly, except blue. Gerhardt adds the reports of Koenig and Simon who found blue-blind areas in the retina in twenty-five persons, of whom fourteen had albuminuric retinitis, three syphilitic retinitis, three central retinitis of unknown origin, and five detachment of the retina.

The vision in the right eye of a young woman, aged nineteen, seen by THOMPSON (192), became suddenly very much obscured, without apparent cause; though she had had attacks of transitory blindness in right eye for three years. There was an absolute scotoma, triangular in outline, extending up and in from point of fixation. The retina between disc and macula, and partly embracing the latter, which appeared as a cherry spot, was oedematous. The macular arteries were smaller than those in the other eye. Rest in bed, alkalines, diuretics, and nitroglycerine were prescribed. The retina and macular arteries regained their normal appearance in eight days. Vision was improved, though finally there was temporal atrophy of the optic nerve, and the scotoma persisted. Thompson regards this as a case of embolism of the common macular or cilio-retinal artery, the embolism being caught at its origin. The occlusion lasted ten days, during which time the nutrition of part of the retina involved was maintained by small branches of central retinal artery, and by the end of that time the embolus was carried farther into the ciliary circulation. The macular arteries appeared singly near the margin of the optic disc.

ARNOLD KNAPP.

DE SCHWEINITZ (193) describes and illustrates with a fine colored plate the appearance of a case of retinitis circinata in a woman of seventy-seven years who had noticed trouble with her eyes some eight years before. It was a typical case in one eye, but in the other deviated from this in so far as the macular region also had a white spot. $V = \frac{2}{200}$. There was no change at the end of five months.

BURNETT.

In case 1, HOTZ (194) records an instance of a bright girl of ten years, who could not read the book unless it was turned upside

down. The last letter looked to her inverted. Large objects appeared erect. On complete atropinization the difficulty disappeared. Case 2 was a boy of six years. In reading he turned the book upside down and for 5 made S, for 13, E1. At twenty feet letters seemed all right. Under atropine and with a proper glass the trouble vanished. Boy seemed otherwise healthy.

BURNETT.

DOWLING (195) made a careful investigation among the tobacco manufacturers of Cincinnati, examining 153 men and 50 women. Among the latter, he found two cases of amblyopia, who had handled moist tobacco as cigar rollers for a large number of years. Neither of them smoked, chewed, or drank. Most of the men do all three, and some of them in excess. Of the men, twenty-three were affected more or less with amblyopia and other signs of tobacco poisoning. Myosis is a very common symptom. Central scotoma for red is nearly constant. He thinks chewing is more productive of toxæmia than smoking.

BURNETT.

In the case reported by JENNINGS (196) the conditions were not those usually observed in snow-blindness, though the patient had been exposed to the glare of snow and to a temperature of 50° below zero. The trouble in vision, without pain, was first noted in the morning after a night of exposure to intense cold. There was torpor of the retina, which was vacillating, V going from $\frac{5}{8}$ to $\frac{5}{20}$ in a few moments. There were no marked changes in the fundus except some fine changes at the m. l. No central scotoma, but marked, though changing contraction of the V. FF.

BURNETT.

MITCHELL (197) gives the picture of a primitive eye-protector used in Alaska for protection against snow-blindness. It consists of a pair of "goggles" carved out of a single piece of wood, with a small aperture to look through, and a projecting shelf above as a further protection. It is said to serve its purpose admirably.

BURNETT.

XX.—OPTIC NERVE.

198. PICK. Black optic discs. *Arch. f. Augenheilk.*, xli., p. 96.

199. HORMUTH. On hereditary affections of the optic nerves. *Beiträge z. Augenheilk.*, 1900, xlii.

A black optic disc from pigmentation of the nerve fibres is but rarely seen ophthalmoscopically, only six cases having been re-

ported. PICK (198) reports a new case discovered accidentally in a girl of seven with high myopia. In the right eye a great mass of white medullated nerve fibres extended out radially and irregularly from the disc. In the middle of the disc was a dark brown, almost black, discoloration interrupted by the reddish appearance of some vessels. In all the cases reported the pigmentation has been congenital, and it may be due to an insufficient absorption of the optic-nerve pigment which is excessively developed in the embryo.

HORMUTH (199) continues Leber's reports on hereditary diseases of the optic nerves. He gives the clinical history of six families seen by Leber in Goettingen between 1873 and 1887, and goes deeply into the literature.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

200. CRAMER. Entrance of a shot into the optic nerve without injury to the ball and with preservation of vision. *Zeitschr. f. Augenheilk.*, iii., p. 152.

201. JOLLY. A case of bilateral paralysis of the facial nerve. *Deutsche med. Wochenschr.*, 1900, No. 9.

202. TOYL. A case of traumatic irideremia with luxation of the lens but without rupture of the ball. *Zeitschr. f. Augenheilk.*, iii., No. 2.

203. HAAB. Traumatic perforations of the macula lutea. *Ibid.*

204. SEGOLCKE. On the pathological anatomy of echinococcus of the orbit. *Graefe's Archiv*, xlix., p. 561.

205. TALKE. Contusion of the eye by a flash of lightning. *Wojenno med. Journ.*, 1900, ii.

In CRAMER'S (200) patient, after a shot injury two wounds of entrance were found at the inferior margin of the left orbit. There was a large central scotoma, $V = \frac{1}{8}\frac{7}{8}$, but otherwise everything was normal. The optic nerve must have been injured centrally from the entrance of the central vessels. Radiographs showed that the shot lay near the optic foramen. Vision increased to $\frac{1}{1}\frac{7}{8}$. The scotoma became much smaller and merely relative.

JOLLY (201) reports a case of bilateral paralysis of the facial nerve depending upon a trauma, in all probability there being a fracture of the base. There was lagophthalmos on both sides. When an attempt was made to close the eyes, the upper lids fell

scarcely at all, while the eyes rolled upward until the corneæ disappeared from view (Bell's phenomenon). The cornea of the right eye was clear, there having been no keratitis e lagophthalgo, but the cornea of the left eye was quite destroyed in the centre, and there was considerable inflammation. The cause was a left-sided affection of the fifth nerve, so that this condition of the left eye was due to a neuromyolytic keratitis and not to a keratitis e lagophthalgo.

HAAB (203) calls attention to the fact that often after severe contusion of the eye the macular region exhibits an injury in the shape of a round hole more or less sharply differentiated from its surroundings. The hole is always surrounded by a gray ring. In the hole, which is proved to be a depression by the parallax displacement, the color seen is not pure red, but a stippling of white and yellow.

SEGOLCKE (204) examined an orbital tumor removed by Wagmann, which proved to be an echinococcus cyst about 3 *cm* in diameter, with a dense wall and soft contents. In the exudation making up the contents were several small nodules, which proved to be small daughter vesicles.

TALKE (205) reports the case of a soldier who was struck by lightning and had the hair of the left side of the head and face singed. Beneath the left orbit was an injury resembling that caused by a hot iron. The patient was deaf. The left lids were swollen, and there was a grayish stripe across the cornea. The pupil was small, and under atropine dilated irregularly. The eye became normal again, but the hearing did not return.

HIRSCHMANN.

XXII.—OCULAR AFFECTIONS IN GENERAL DISEASES.

206. SALINGER. The treatment of cataract in cases of general disease. *Inaug. Dissert.*, Berlin (Hirschberg's clinic), 1900.

207. PROKOPENKO. Unusual case of choroiditis. *Wjest. Ophth.*, 1900, No. 1.

208. VALUDE. Visual and ophthalmoscopic disturbances of cardiac origin. *Ann. d'ocul.*, cxxiii., p. 194.

209. BOREL. Hystero-traumatism and pseudo-hystero-traumatism of the eye. A clinical and medico-legal monograph. *Ibid.*, p. 1.

210. ZEEPER. On skin and eye affections in persons who work over hyacinth bulbs. *Ned. Oogh. Bydr.*, No. 9.

211. HEDDÆUS. On the treatment of scrofulous eye diseases. *Wochenschr. f. Ther. u. Hyg. d. Auges*, Apr., 1900.

212. BRECHT. On eye affections in late hereditary syphilis. *Charité-Annalen*, 1899, xxiv.

213. DÜRING and TRAUTAS. Ophthalmoscopic changes in leprosy. *Deutsche med. Wochenschr.*, 1900, No. 9.

214. WOLFF, A. On syphilitic papules of the ocular mucosa. *Berl. klin. Wochenschr.*, 1900, No. 3.

215. BRUNS and STÖLTING. On affections of the optic nerves in the early stages of multiple sclerosis. *Zeitschr. f. Augenheilk.*, iii., Nos. 1 and 2.

216. HAWTHORNE. The eye symptoms of locomotor ataxia, with a clinical record of thirty cases. *Brit. Med. Jour.*, March 3, 1900.

SALINGER (206) describes Hirschberg's methods of dealing with cataract patients who suffer from general diseases. If the patient has diabetes, a Carlsbad treatment is instituted, and if improvement takes place, the operation is done without iridectomy. Diabetic coma after operation is avoided by testing the urine with acetone and rejecting the suspicious cases. Alcoholic patients have morphine given them immediately after the operation, and hydrate of chloral and alcohol in the evening. In chronic affections of the air-passages it is generally best to operate with iridectomy on account of the danger of having the wound forced open.

PROKOPENKO'S (207) patient was a man of forty-eight, on whom a gastro-enterostomy was made. Six days later foci of pneumonia were found in the right lung and later an abscess appeared in the scrotum. The right eye suddenly became blind from purulent choroiditis. In pus from the eye and from various abscesses that formed, as well as in the blood, the staphylococcus aureus was found.

HIRSCHMANN.

VALUDE (208), in a cyanotic patient with a heart lesion, observed a progressive diminution of vision. In the fundus there was nothing abnormal except excessive venous stasis. The patient died with symptoms of asystole. At the autopsy there was found great congestion of the veins of the brain and hemorrhages in both cortical visual centres, more extensive on the right side than the left. At the last test $R V = \frac{2}{3}$, $L V = \frac{1}{10}$.

BERGER.

The comprehensive paper by BOREL (209) treats of the eye symptoms arising from traumatic hysteria and their significance from a medico-legal aspect. A single symptom of hysteria may appear, such as erythropsia, astigmatism in consequence of partial spasm of the fibres of the ciliary muscle, bilateral mydriasis, lachrymation (with or without unilateral hyperidrosis of the face, spasm of the ocular muscles, insufficiency of convergence, and the like).

It is noteworthy that several months may elapse after the trauma before the hysterical symptoms appear.

The affection which ZEEPER (210) describes consists in conjunctivitis with photophobia associated with itching of the face and arms. The cause lies in the dry dust about the bulbs, which contains small worms and larvæ and small needle-shaped crystals. When the author rubbed some of this dust on his arm it caused this itching, which lasted for twenty minutes.

The great value of the local use of calomel and the yellow salve in many scrofulous affections of the eye suggests a specific action of these mercurial preparations, and leads one to try to obtain a similar result by using mercurials internally or through the skin. In earlier times calomel was much used as an anti-scrofulous remedy, but to-day it is less frequently employed. Yet it should not be altogether forgotten. For years HEDDÆUS (211) has prescribed calomel in nearly every case of phlyctenula and blepharoadenitis. His results are so good that he wishes to call the attention of practitioners to the value of this drug. He gives as many milligrammes per diem as the infant is months old, and as many centigrammes as the young child is years old. After the age of five the dose cannot be increased in the same ratio, and the ordinary precautions must be taken to avoid poisoning. Gray ointment acts even more quickly and more energetically than mercurials given internally.

BRECHT (212) reports on the retinal changes due to hereditary syphilis as seen in three children of one family. A point of interest was the fact that two of the children exhibited no signs of syphilis except pigmentary degeneration of the retina and general weakness. Apparently the mother had become infected after the birth of the first child, which was healthy. She had been pregnant eleven times, and had aborted three times, and had eight living children of whom six died early. She has a sunken bridge of the nose and ozæna. These cases show that the correct in-

terpretation of the ophthalmoscopic picture may enable one to diagnose hereditary syphilis even when all other signs are wanting.

DÜRING and TRAUTAS (213) found ten patients with leprosy who had a more or less pronounced peripheral chorio-retinitis similar to the syphilitic form. There were patches of various sizes and colors. For the most part they were dark, but often atrophic. External affections of the eye are very common in leprosy but changes in the fundus have not hitherto been described.

BRUNS and STÖLTING (215) in their introduction take up the literature of the eye symptoms in multiple sclerosis, emphasizing the statement of Oppenheim's that optic neuritis or atrophy may precede the onset of the disease by many years. They then report on three carefully studied cases which confirm this view. Among 5500 cases of nervous disease seen by them in the course of twelve years, the diagnosis multiple sclerosis was made 70 times, or in $1\frac{1}{3}\%$. Of these, 21, or 30%, had some affection of the optic nerve. Excluding 32 cases in which the diagnosis was not altogether certain, the 21 cases with optic-nerve affections, all of which were in the remaining 38 cases, would make the percentage 58.

HAWTHORNE (216) states that the eye symptoms—the Argyll-Robertson pupil, ocular paralyses, and optic-nerve atrophy—may precede evidence of any spinal lesion. It is probable that in those cases where the disease first affects the nervous apparatus of the eyeball the spinal symptoms are slight in degree and delayed in development. Thirty cases were reported with a view of supporting the following conclusions: (1) that any one of these ocular disturbances may exist as an isolated symptom for a considerable time, presumably for years; (2) that any two of these may be associated together with an increasing presumption that the diseased process causing them is of the locomotor ataxia order; (3) that any one of the three, or a combination of two or of all of them, may exist in conjunction with a greater or less degree of evidence of spinal disease; and (4) that occasionally a case which commences with purely ocular symptoms may be seen to develop, with comparative rapidity, characteristic symptoms of the spinal lesion of locomotor ataxia.

ARNOLD KNAPP.

BOOK NOTICES.

XVII.—Injuries to the Eye in their Medico-Legal Aspect.

By DR. S. BAUDRY, Professor in the Faculty of Medicine University of Lille, France ; a portion of the medico-legal chapter, which consists of eight pages, being credited to Professor Jacquey. Translated by Dr. Alfred James Ostheimer, Jr. Revised and edited by Dr. Charles A. Oliver. With an adaptation of the medico-legal chapter to the courts of the United States by Charles Sinkler, Esq. Furthermore, four persons are mentioned in the American editor's preface, as having given assistance during the preparation of the English manuscript copy.

Philadelphia, New York, Chicago : The F. A. Davis Company, 1900.

It does not appear that this little book of 140 pages of text, small octavo, contains much more information in regard to injuries of the eye than is to be found in any elementary text-book of ophthalmology, not to mention Praun's recent exhaustive work on the subject. And the contents of the short medico-legal chapter do not seem to differ particularly in kind from the usual platitudes in legal verbiage which the professor of legal medicine offers in his annual lecture at the medical school. W. A. H.

XVIII.—A Manual of Personal Hygiene. Edited by Walter L. PYLE, A.M., M.D., Assistant Surgeon Wills Eye Hospital, Philadelphia. W. B. Saunders & Co., Philadelphia, 1900.

A neatly gotten up 8vo. vol. of 344 pages, treating of a subject of universal importance in an admirable way and in such a manner as to be interesting and instructive to any physician of whatever denomination or occupation he may be, and it will be useful to every educated man or woman, in particular to mothers and teachers. The contents are divided into seven departments, each

written by an authority in that branch, viz.: Hygiene of the Digestive Apparatus, by Charles G. Stockton, Buffalo; Skin and its Appendages, by Geo. H. Fox, New York; The Vocal and Respiratory Apparatus, by E. Fletcher Ingals, Chicago; The Ear, by B. Alex. Randall, Philadelphia; The Eye, by Walter L. Pyle, Philadelphia; The Brain and Nervous System, by J. W. Courtney, Boston; and Physical Exercise, by G. N. Steward, Cleveland. The part relating to the Hygiene of the Eye occupies 105 pages, introducing—in keeping with the other departments—the subject by a general description of the eyeball and its diseases. The chief chapters are on ametropia and eye-strain, visual tests, the general care of the eyes and school-hygiene (infant eyes, the dangers of the kindergarten,—giving young eyes too much near-work,—the school-hygiene is treated in full detail), spectacles, and eyeglasses.

The whole book is written in a conservative spirit, containing nothing particularly new, but it is highly attractive by its easy, yet careful style. It will have a large circle of readers, for it helps the general practitioner to acquaint himself with what he will care to know of the most important so-called specialties—the higher senses, the cutaneous, digestive, respiratory, muscular, and nervous apparatuses,—whereas the specialist will read with great satisfaction the essentials of the other departments. He will regret that the circulatory system has not been included in this useful, popular-scientific treatise.

H. K.

MISCELLANEOUS NOTES.

Dr. VON GROSZ has been appointed Professor of Ophthalmology at Budapest.

Prof. EVERSBUCH at Erlangen has been appointed successor to Prof. A. v. Rothmund (resigned) in Munich.

Dr. BACH of Wurzburg has been appointed Professor in Ordinary at Marburg.

Prof. OELLER in Munich has been appointed Professor in Ordinary at Erlangen.

The A. VON GRÄFE triennial prize has been awarded to Prof. Hess at Wuerzburg, and Dr. St. Bernheimer in Vienna.

CORRECTION.—My attention has been called to a mistake in proof-reading in the foot-note of my paper on Double Nasal Hemianopsia (these ARCHIVES, xxix., 1, p. 1.), in which it is stated

that Veasey's article on Nasal Hemipia appeared in the "Ophthalmic *Review*," whereas it should have been the "Ophthalmic *Record*."

SWAN M. BURNETT.

The Third Pan-American Medical Congress will be held in Havana, Cuba, December 26, 27, 28, and 29, 1900.

President : Dr. Juan Santos Fernandez.

First Vice-President : Dr. Gustavo Lopez.

Treasurer : Dr. Enrique Acosta.

Secretary : Dr. Thomas V. Coronado.

Place of the Executive Commission, Prado, 105.

The sessions will be held from 8-11 A.M., and from 3-5 P.M. Authors of papers should send an abstract—not exceeding 300 words—to the Secretary, before Nov. 15th.



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Fig. 1.



Fig. 2.



Fig. 3.

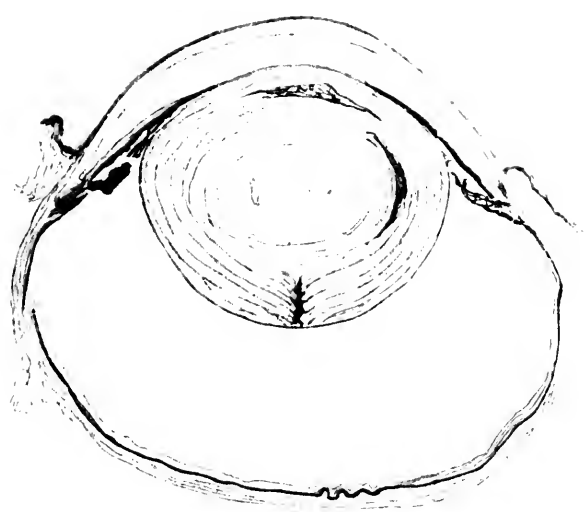
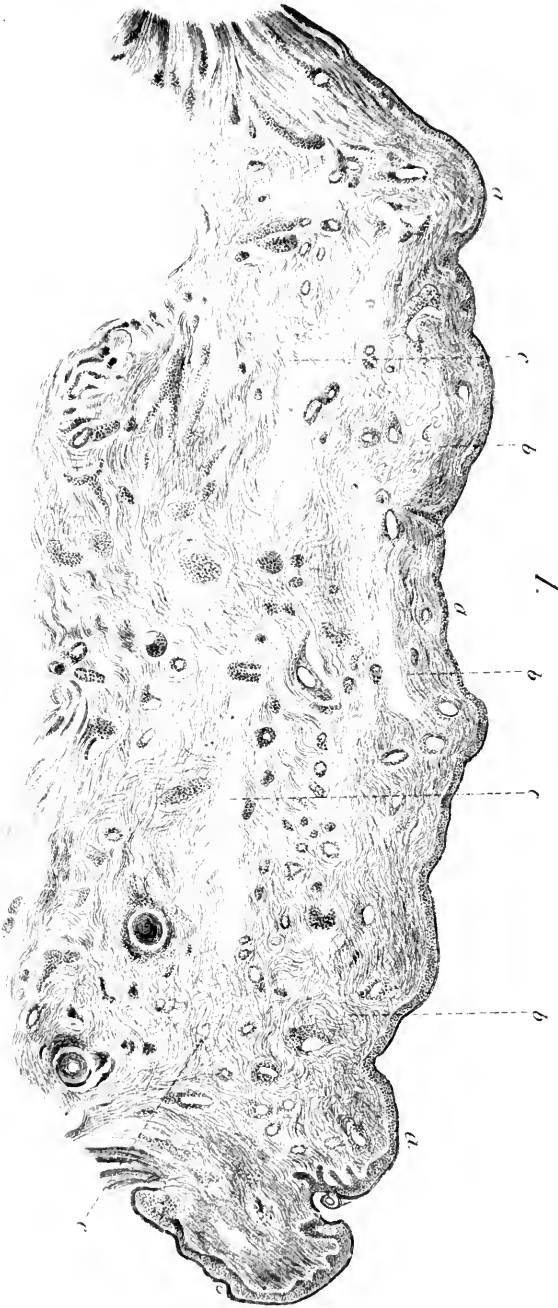
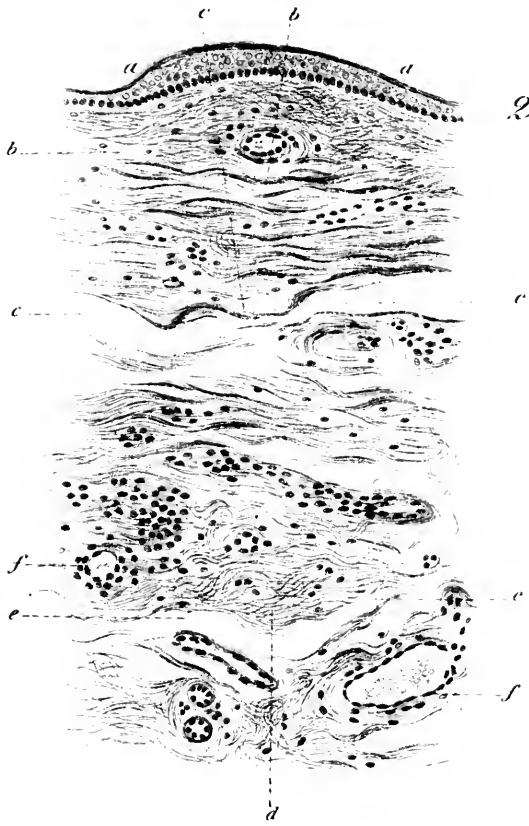


Fig. 1 u. 3. Bück.
Fig. 2. Axenfeld dehn.







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